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ONTARIO
DEPARTMENT OF MINES

HON. G. C. WARDROPE, *Minister*

D. P. DOUGLASS, *Deputy Minister*

M. E. HURST, *Director, Geological Branch*

**Statistical Review of the Mineral Industry and
Mining Operations for 1962**

By

T. J. KELLY AND G. S. RIDDELL

Annual Report for the Year 1962

Volume 72

TORONTO

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INTRODUCTORY LETTER

TO THE HONOURABLE G. C. WARDROPE
Minister of Mines

Sir: The undersigned has the honour to submit to you the Seventy-second Annual Report of the Ontario Department of Mines.

Geological reports, previously bound as parts of the annual volume, are not included. These now constitute a new series of Geological Reports.

Respectfully submitted,
D. P. DOUGLASS
Deputy Minister of Mines

DEPARTMENT OF MINES
Toronto, 1964.

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Statistical Review of the Mineral Industry and Mining Operations for 1962

By

T. J. Kelly¹ and G. S. Riddell²

Note: Prior to the publication of Volume LXX, the Annual Report consisted of: Statistical Review of the Mineral Industry (Part 1); Mining Operations (Part 2); subsequent parts of the volume were geological reports.

Starting with Volume LXX, the Annual Report consists of only former Parts 1 and 2, which are now combined. Geological reports that refer to specific geographical areas have been separated from the Annual Report to form a new series of Geological Reports.

GENERAL SUMMARY

MINERAL PRODUCTION

The value of mineral production in Ontario in 1962 decreased 3.21 percent from that of 1961. The drop is accounted for mainly by the decreased production value of copper, gold, nickel, and uranium oxide. Gains were made by the platinum metals; silver and zinc in the metallics; and by salt, cement, sand and gravel and clay products in the non-metallic minerals and structural materials.

The value of the metallics produced in the Sudbury district was 56.03 percent of the total for the province. The Blind River area produced 14.95 percent, Rainy River and Kenora 7.13, Porcupine 5.73, Thunder Bay 6.25, the Kirkland Lake and Larder Lake area 3.46, Eastern Ontario 3.17, Algoma 2.19 and the Cobalt area 1.09 percent of the metallic wealth.

The value of metallics decreased 6.53 percent from 1961; the value of non-metallics increased 12.17; and the value of structural materials increased 10.18 percent.

Metallics made up 79.90 percent of the total production value, non-metallics made up 4.03 percent, and structural materials made up 16.07 percent.

During the year the metal mines paid out \$109,880,914 in dividends.

Twenty-four gold mines received assistance under the Emergency Gold Mining Assistance Act, which was in force throughout the year.

¹Statistician, Ontario Department of Mines.

²Engineer of Mines, Ontario Department of Mines.

SUMMARY OF MINERAL STATISTICS, 1962

Product	Quantity	Value	Wage-Earners ⁽¹⁾	Wages
METALLICS				
Gold.....	2,421,249 oz.	\$ 90,578,924	9,678	\$ 38,090,056
Silver.....	9,383,445 oz.	10,931,713	494	2,096,851
Copper in matte exported.....	33,175,644 lb.	9,455,058		
Copper, metal and concentrates.....	344,815,046 lb.	106,892,665		
Nickel, matte, metal and salts.....	333,163,344 lb.	274,219,955		
Platinum metals.....	470,782 oz.	28,848,262	18,520	94,082,050
Selenium.....	142,915 lb.	821,761		
Tellurium.....	7,011 lb.	42,066	(2)	(2)
Cobalt, metal and salts.....	2,649,193 lb.	4,765,808		
Iron ore.....	6,414,936 tons	64,479,510	1,867	10,226,805
Calcium.....	123,511 lb.	124,412		
Magnesium.....	17,631,310 lb.	4,821,823		
Lead.....	2,287,087 lb.	226,879	648	3,364,480
Zinc.....	126,264,684 lb.	15,278,027	3,089	18,036,719
Uranium oxide (U ₃ O ₈).....	12,805,203 lb.	118,283,081		
Total.....	—	\$729,769,944	34,296	\$165,896,961

NON-METALLICS AND FUELS

Arsenic trioxide.....	160,750 lb.	\$ 6,832	(3)	(3)
Mica, amber.....	501,272 lb.	9,248		
Mineral water.....	5,200 gals.	2,780		
Natural gas.....	15,648,294 M cu. ft.	5,802,387	not available	not available
Petroleum.....	1,134,534 bbbls.	3,661,174	67	217,395
Quartz.....	1,352,613 tons	1,077,784	473	2,350,635
Salt.....	3,155,589 tons	15,387,911		

			(6)		(6)
Sulphur ⁽⁴⁾			952,877		
Asbestos.....	35,551	tons	5,686,720		
Gypsum.....	435,140	tons	1,007,818	481	2,312,041
Nepheline syenite.....	254,418	tons	2,605,421		
Peat moss.....	24,801	tons	455,826		
Talc.....	8,082	tons	127,912		
Total.....	————		\$ 36,784,690	1,021	\$ 4,880,071
STRUCTURAL MATERIALS					
Cement.....	2,510,783	tons	\$ 38,704,090	831	\$ 4,637,504
Hydrated lime.....	108,545	tons	2,069,068	387	1,648,612
Quicklime.....	802,385	tons	8,458,842		
Sand and gravel.....	76,600,813	tons	52,365,204	1,695	6,359,640
Stone.....	18,797,648	tons	25,043,550	1,263	4,952,223
Clay Products:					
Brick, face.....	223,212	M	11,461,627		
Brick, common.....	21,287	M	499,094		
Brick, fancy and ornamental, special glazes.....	9,982	M	831,218		
Brick, sewer.....	1,046	M	41,654		
Tile, drain.....	47,429	M	2,729,705	1,601	6,069,391
Tile, structural, roofing, and floor.....	————		1,026,509		
Sewer pipe, copings, flue-linings, etc.....	————		1,742,948		
Miscellaneous.....	————		1,814,031		
Total.....	————		\$146,787,540	5,777	\$ 23,667,370
Grand Total.....	————		\$913,342,174	41,094	\$194,444,402

(1) "Wages-Earners" for any mineral industry represents the employees of companies whose chief product is that mineral, or employees of the companies who produce the greater part of the total quantity of that mineral.
 (2) included with Nickel-Copper and Silver.
 (3) included with Silver.
 (4) Value of elemental sulphur and sulphur content of sulphuric acid produced from smelter gases.
 (5) included with Nickel-Copper.

COMPARATIVE OUTPUT AND VALUE OF MINERAL PRODUCTION

Product	1958	1959	1960	1961	1962
METALLICS					
Bismuth	lb. \$ 18,581 26,779	31,457 37,748	37,835 45,402	19,923 22,388	_____
Calcium	lb. \$ 25,227 31,256	67,429 76,409	134,801 159,241	99,355 100,881	123,511 124,412
Cobalt	lb. \$ 2,436,064 4,866,767	2,835,684 5,414,246	3,258,401 6,312,921	2,884,420 4,309,912	2,649,193 4,765,808
Copper	lb. \$ 284,069,476 71,267,895	376,544,371 110,547,037	412,544,528 123,750,235	423,293,547 122,421,860	377,990,690 116,347,723
Gold	oz. \$ 2,716,514 92,192,231	2,683,449 90,083,383	2,732,673 92,774,248	2,637,720 93,533,551	2,421,249 90,578,924
Iron Ore	tons \$ 3,644,952 36,851,421	6,018,089 50,830,404	5,325,197 48,399,442	5,772,664 62,350,773	6,414,936 64,479,510
Lead	lb. \$ 2,513,224 285,502	3,222,447 341,902	1,661,896 177,490	1,670,535 170,562	2,287,087 226,879
Magnesium	lb. \$ 9,087,362 2,747,755	8,144,940 2,202,392	14,577,138 4,313,987	15,270,618 4,307,570	17,631,310 4,821,823
Nickel	lb. \$ 254,286,784 177,168,918	347,929,183 240,053,265	403,300,283 277,924,234	392,435,773 295,423,149	333,163,344 274,219,955
Platinum metals	oz. \$ 300,458 14,321,443	328,091 16,932,178	483,585 28,871,955	418,278 24,534,349	470,782 28,848,262
Pyrrhotite	tons \$ 279,422 655,569	_____	_____	_____	_____
Selenium	lb. \$ 90,295 677,213	101,400 709,800	144,500 1,011,500	164,800 1,071,200	142,915 821,761

Silver	oz.	9,815,257 8,529,142	10,540,856 9,252,763	11,220,823 9,976,434	8,870,402 8,361,240	9,383,445 10,931,713
Tellurium	lb.	6,992 11,376	6,900 14,835	7,450 26,075	8,050 39,043	7,011 42,066
Thorium	lb.	— —	47,447 105,676	(1) (1)	(1) (1)	(1) (1)
Uranium Oxide (U ₃ O ₈)	lb.	19,970,136 210,149,700	25,492,171 268,529,993	19,793,727 211,983,533	14,970,593 151,060,610	12,805,203 118,283,081
Zinc	lb.	92,478,339 10,061,643	89,963,215 11,011,498	90,459,368 12,076,326	103,874,146 13,077,755	126,264,684 15,278,027
Total Value	\$	629,844,610	806,775,669	818,565,684	780,784,843	729,769,944

NON-METALLICS

Arsenic trioxide	lb.	2,323,320 94,542	1,578,307 63,786	1,724,326 70,400	419,300 16,772	160,750 6,832
Asbestos	tons	21,650 3,849,370	24,350 4,327,628	23,284 4,128,920	25,047 4,362,668	35,551 5,686,720
Fluorspar	tons	1,256 57,834	100,594	100,811	38,400	—
Garnet	tons	— —	— —	32 4,480	80 3,200	— —
Gypsum	tons	425,733 1,059,590	412,100 1,017,340	355,603 871,408	425,287 991,944	435,140 1,007,818
Mica, amber	lb.	17,590 736	35,433 531	345,777 5,745	192,540 14,332	501,272 9,248
Mica, white	lb.	6,961 1,370	325 428	— —	420 630	— —
Mineral water	gals.	2,433 1,946	3,025 1,936	2,626 1,890	6,985 2,786	5,200 2,780

(1)Not available.

COMPARATIVE OUTPUT AND VALUE OF MINERAL PRODUCTION—Continued

Product	1958	1959	1960	1961	1962
NON-METALLICS—Continued					
Natural gas	M cu. ft. \$	16,147,986 16,335,742	16,987,056 6,573,990	14,544,165 5,614,048	15,648,294 5,802,387
Nepheline syenite	tons \$	201,306 2,613,446	228,722 2,930,932	240,636 2,891,095	240,320 2,572,169
Peat moss	tons \$	6,123 216,055	10,925 295,390	13,566 338,614	15,113 251,352
Petroleum, crude	bbls. \$	778,341 2,623,000	1,001,580 3,194,000	1,005,030 3,150,065	1,149,087 3,546,740
Quartz and quartzite	tons \$	922,599 666,275	1,600,352 1,363,541	1,659,410 998,281	1,540,016 827,061
Silica brick	M \$	1,740 187,061	1,123 114,684	— —	— —
Salt	tons \$	2,126,483 10,204,472	3,036,230 13,228,977	3,007,599 13,994,545	2,861,705 13,586,373
Sulphur ⁽¹⁾	tons \$	— 622,619	— 1,041,857	— 985,717	— 855,058
Talc and soapstone	tons \$	8,725 125,511	8,796 125,903	7,189 102,645	7,417 107,660
Total Value	\$	40,083,827	44,143,269	34,218,606	32,791,193
STRUCTURAL MATERIALS					
Portland cement	tons \$	2,400,158 35,195,552	2,386,334 31,731,767	2,007,044 30,699,800	2,226,923 35,671,569
Lime, hydrated, and quicklime	tons \$	1,009,916 12,644,925	1,130,055 14,006,532	990,088 12,278,630	865,130 11,548,132
					910,930 10,527,910

Sand and gravel	tons	67,469,064	73,981,703	77,660,833	70,208,199 ⁽²⁾	76,600,813
	\$	40,055,031	39,695,602	43,929,708	40,344,071	52,365,204
Stone	tons	15,756,560	17,288,796	17,938,583	18,361,843 ⁽²⁾	18,797,648
	\$	20,670,480	22,053,425	23,220,659	23,493,092	25,043,550
Total Value	\$	108,565,988	107,487,326	110,128,797	111,056,864	126,640,754
CLAY PRODUCTS						
Face brick	M	254,453	249,554	205,361	210,129 ⁽²⁾	223,212
	\$	14,608,555	14,441,307	11,734,214	10,970,285	11,461,627
Common brick	M	17,978	21,420	33,138	26,621	21,287
	\$	591,662	547,260	1,080,471	668,162	499,094
Fancy and ornamental brick, special glazes	M	450	291	590	4,102	9,982
	\$	52,820	34,092	81,459	403,608	831,218
Sewer brick	M	1,091	1,205	1,061	1,317	1,046
	\$	47,923	48,185	42,496	49,018	41,654
Drain tile	M	49,163	44,483	51,637	53,837	47,429
	\$	2,909,168	2,595,721	2,954,594	3,201,745	2,729,705
Tile, structural, roof, etc.	\$	990,159	1,138,045	1,168,631	1,068,551	1,026,509
Sewer pipe, copings, flue linings, etc.	\$	2,624,679	2,317,028	1,238,500	1,714,166	1,742,948
Pottery and other products	\$	961,325	1,053,257	1,440,237	961,021	1,126,310
Haydite and clay	\$	—	—	450,723	—	687,721
Total Value	\$	22,786,291	22,174,895	20,191,325	19,036,556	20,146,786
GRAND TOTAL	\$	801,280,716	980,581,159	983,104,412	943,669,456	913,342,174

⁽¹⁾Value of elemental sulphur and sulphur content of sulphuric acid produced from smelter gases.

⁽²⁾Revised figures.

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TOTAL MINERAL PRODUCTION

Year	Metallics	Non-Metallics	Structural Materials	Clay Products	Total
To 31 Dec. 1957.....	8,032,235,596	\$602,697,078	\$1,063,591,504	\$315,193,930	\$10,013,718,108
1958.....	629,844,610	40,083,827	108,565,988	22,786,291	801,280,716
1959.....	806,775,669	44,143,269	107,487,326	22,174,895	980,581,159
1960.....	818,565,684	34,218,606	110,128,797	20,191,325	983,104,412
1961.....	780,784,843	32,791,193	111,056,864	19,036,556	943,669,456
1962.....	729,769,944	36,784,690	126,640,754	20,146,786	913,342,174
To 31 Dec. 1962.....	\$11,797,976,346	\$790,718,663	\$1,627,471,233	\$419,529,783	\$14,635,696,025

Metal Production

Metallic minerals have accounted for 80.61 percent of the accumulated mineral production value for the recorded history of the mining industry in Ontario.

METAL PRODUCTION TO 31 DECEMBER 1962

Metal or Product	To 31 December 1961	1962	To 31 December 1962
Barium.....	\$ 9,266	—	\$ 9,266
Bismuth.....	416,066	—	416,066
Calcium.....	11,537,593	124,412	11,662,005
Cerium, rare earths.....	988	—	988
Chromite.....	55,090	—	55,090
Cobalt.....	99,036,573	4,765,808	103,802,381
Copper.....	1,789,374,211	116,347,723	1,905,721,934
Gold.....	2,968,850,728	90,578,924	3,059,429,652
Iron ore.....	474,361,299	64,479,510	538,840,809
Lead.....	7,868,605	226,879	8,095,484
Magnesium.....	46,599,121	4,821,823	51,420,944
Molybdenum.....	224,110	—	224,110
Nickel.....	3,732,291,855	274,219,955	4,006,511,810
Pig iron, from domestic ore.....	98,257,508	—	98,257,508
Platinum metals.....	471,116,614	28,848,262	499,964,876
Pyrrhotite.....	3,495,154	—	3,495,154
Selenium.....	11,607,594	821,761	12,429,355
Silver.....	366,217,039	10,931,713	377,148,752
Tellurium.....	397,934	42,066	440,000
Thorium.....	105,676	—	105,676
Tungsten.....	808,338	—	808,338
Uranium oxide (U ₃ O ₈).....	934,513,520	118,283,081	1,052,796,601
Zinc, in ore and concentrates.....	51,061,520	15,278,027	66,339,547
Total.....	\$11,068,206,402	\$729,769,944	\$11,797,976,346

Dividends

DIVIDENDS PAID BY METAL MINING COMPANIES TO 31 DECEMBER 1962

Industry	To 31 December 1961	1962	To 31 December 1962
Gold	\$ 741,471,877	\$ 17,230,119	\$ 758,701,996
Nickel-copper	1,179,472,061	70,979,901	1,250,451,962
Silver-cobalt	107,477,087	241,875	107,718,962
Uranium	47,425,803	21,429,019	68,854,822
Total	\$2,075,846,828	\$109,880,914	\$2,185,727,742

Metal Prices and Exchange

METAL PRICES AND EXCHANGE, 1961 AND 1962

Month	Average Exchange Rate, U.S. Dollar in Canadian Dollars	Pound Sterling in Canadian Dollars	Silver, Cents per Ounce		Copper, Cents per Pound, New York Export, U.S. Funds	Gold in Canadian Dollars per Ounce
			New York Market, U.S. Funds	Montreal, Canadian Funds		
1961						
January	0.9929	2.7868	91.375	91.19	26.746	34.756
February	0.9896	2.7709	91.375	90.88	27.040	34.624
March	0.9873	2.7624	91.375	91.00	27.303	34.563
April	0.9889	2.7672	91.375	91.13	27.781	34.609
May	0.9875	2.7593	91.375	91.00	29.505	34.563
June	1.0055	2.8055	91.375	92.13	28.701	35.192
July	1.0341	2.8827	91.375	95.19	27.873	36.189
August	1.0315	2.8914	91.375	95.00	28.087	36.102
September	1.0308	2.8989	91.375	94.97	28.036	36.076
October	1.0303	2.9010	91.375	94.88	27.875	36.066
November	1.0357	2.9158	92.313	95.40	28.005	36.255
December	1.0427	2.9299	103.325	108.37	28.072	36.495
Average	(1)1.0132	(1)2.8395	92.449	94.26	27.919	35.457
1962						
January	1.0450	2.9378	104.284	109.93	28.060	36.577
February	1.0487	2.9521	102.472	108.68	28.620	36.706
March	1.0494	2.9545	101.500	107.25	28.600	36.727
April	1.0498	2.9545	101.500	107.28	28.598	36.763
May	1.0823	3.0437	101.500	110.32	28.545	37.873
June	1.0878	3.0553	102.274	111.97	28.571	38.062
July	1.0789	3.0284	103.548	112.37	28.538	37.762
August	1.0776	3.0218	108.304	116.90	28.564	37.717
September	1.0768	3.0167	115.461	124.34	28.588	37.687
October	1.0760	3.0147	120.614	130.00	28.529	37.660
November	1.0768	3.0173	119.171	129.17	28.488	37.687
December	1.0760	3.0166	119.875	129.43	28.488	37.660
Average	(1)1.0689	(1)3.0015	108.375	116.47	28.516	37.406

(1)Computed from daily quotations.

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Prospecting

There was a slight increase in prospecting activity in 1962. A total of 17,157 claims was recorded as compared with 16,623 in 1961. The recording offices in the Fort Frances, Kowkash, Larder Lake, Montreal River, Port Arthur, Sault Ste. Marie and Timiskaming mining divisions reported more claims recorded in 1962 than in 1961. The greatest number of claims recorded was 2,088 in the Port Arthur mining division, immediately followed by those recorded in Sault Ste. Marie, Montreal River, Larder Lake, Porcupine, Kowkash and Sudbury mining divisions. There were 5,274 licences issued and renewed in 1962; 5,459 in 1961.

MINERS' LICENCES AND MINING CLAIMS, 1962

Mining Division	Miners' Licences		Mining Claims	
	Issued	Renewed	Recorded	Cancelled
Eastern Ontario.....	—	—	504	658
Fort Frances.....	32	59	444	305
Kenora.....	94	88	856	1,195
Kowkash ⁽¹⁾	—	—	1,362	1,805
Larder Lake.....	95	220	1,701	1,452
Montreal River.....	60	101	1,705	999
Parry Sound.....	—	—	58	60
Patricia.....	92	89	1,272	2,043
Porcupine.....	157	185	1,440	1,425
Port Arthur.....	310	376	2,088	2,823
Red Lake.....	54	90	1,055	1,342
Sault Ste. Marie.....	181	176	2,055	1,284
Sudbury.....	182	276	1,348	1,949
Timiskaming.....	103	154	1,269	1,577
At Toronto.....	428	1,672	—	—
Total.....	1,788	3,486	17,157	18,917

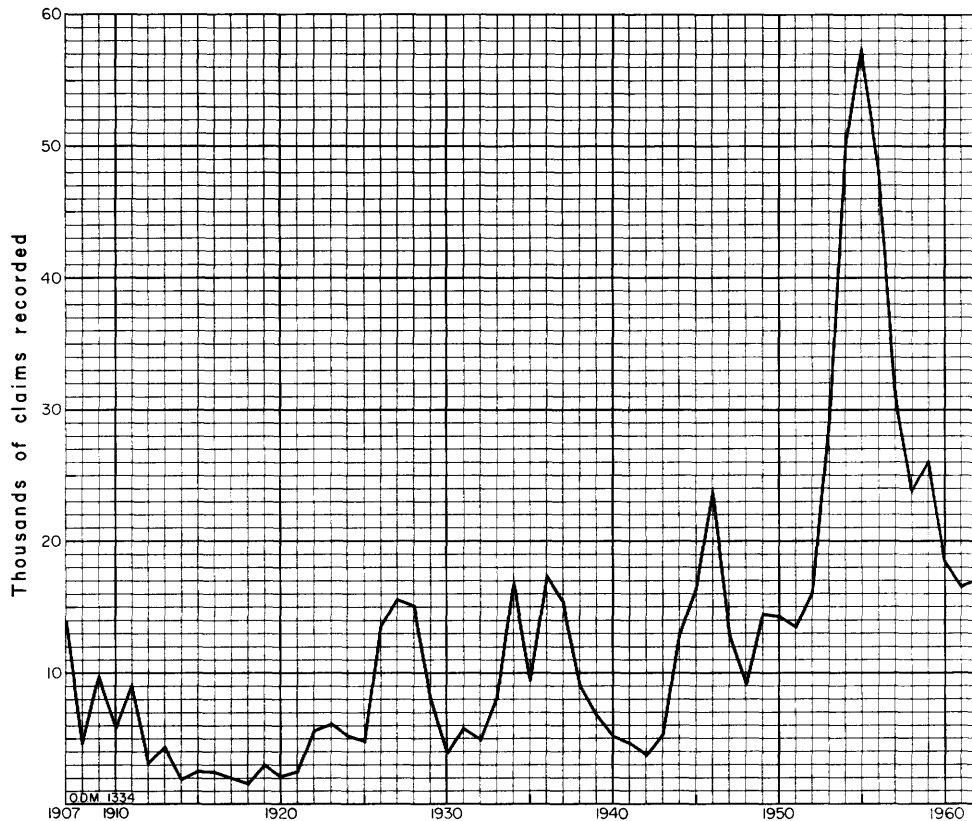
⁽¹⁾Handled by the office of the Patricia Mining Division since 1 April 1956.

MINING CLAIMS RECORDED IN THE ONTARIO MINING DIVISIONS

Mining Division	1956	1957	1958	1959	1960	1961	1962
Eastern Ontario.....	4,111	2,003	987	993	507	806	504
Fort Frances.....	1,103	433	801	422	402	199	444
Kenora.....	2,731	1,247	1,090	1,146	1,162	961	856
Kowkash ⁽¹⁾	—	3,549	896	1,368	774	1,043	1,362
Larder Lake.....	2,112	1,630	2,276	3,540	1,430	1,421	1,701
Montreal River.....	2,556	1,458	1,462	1,579	1,670	1,211	1,705
Parry Sound.....	423	291	39	182	186	136	58
Patricia.....	3,150	3,074	2,002	2,628	1,912	1,612	1,272
Porcupine.....	1,536	2,456	1,451	2,247	1,321	1,443	1,440
Port Arthur.....	8,532	4,351	4,027	3,479	3,095	2,064	2,088
Red Lake.....	2,657	1,078	2,657	2,554	1,227	1,076	1,055
Sault Ste. Marie.....	5,313	2,842	1,385	1,112	943	1,436	2,055
Sudbury.....	8,768	4,959	3,063	3,481	1,921	2,098	1,348
Timiskaming.....	5,005	1,576	1,844	1,300	1,924	1,117	1,269
Total.....	47,997	30,947	23,980	26,031	18,474	16,623	17,157

⁽¹⁾Handled by the office of the Patricia Mining Division since 1 April 1956.

MINING CLAIMS RECORDED, 1907-1962

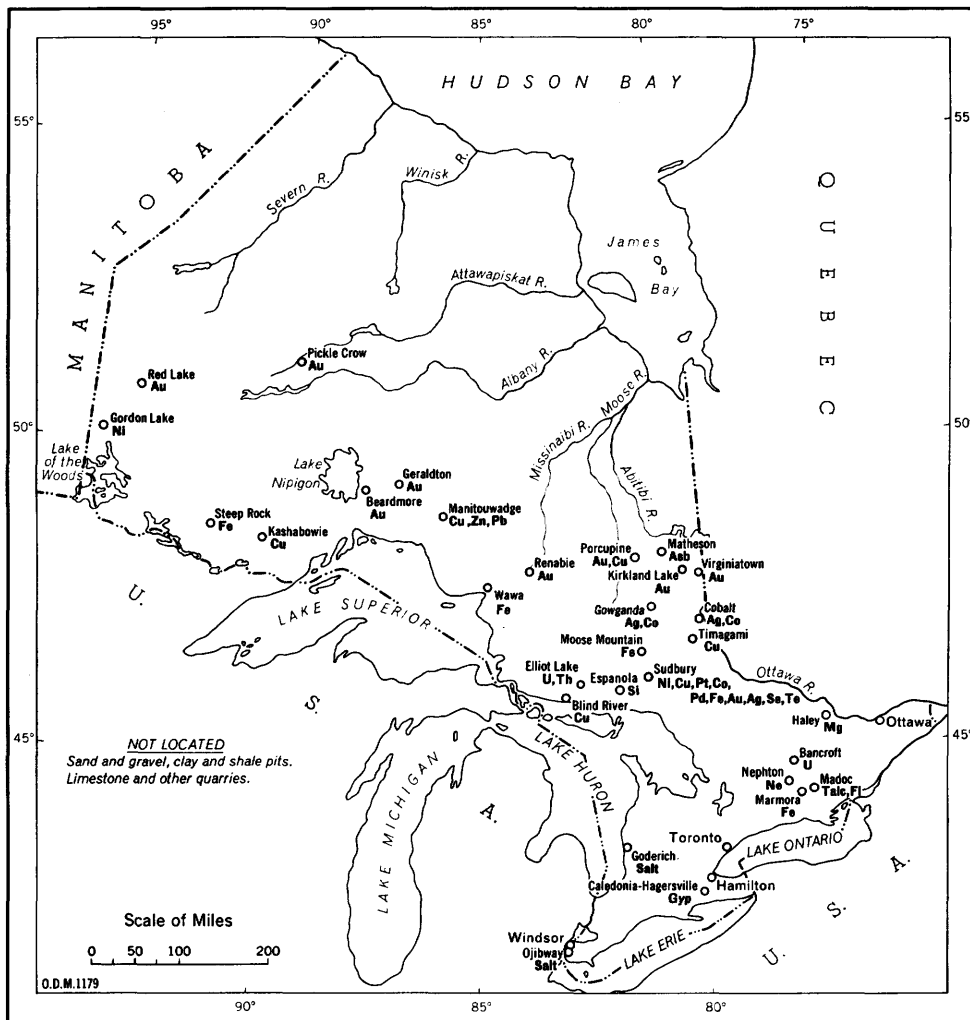


MINING CLAIMS CANCELLED IN THE ONTARIO MINING DIVISIONS

Mining Division	1956	1957	1958	1959	1960	1961	1962
Eastern Ontario.....	5,075	4,974	3,270	1,701	1,629	728	658
Fort Frances.....	1,651	1,177	833	630	619	356	305
Kenora.....	3,249	3,595	2,433	1,697	1,368	1,133	1,195
Kowkash ⁽¹⁾		3,288	1,526	1,228	1,975	1,412	1,805
Larder Lake.....	1,450	2,004	2,201	1,604	3,667	1,450	1,452
Montreal River.....	792	2,196	1,911	1,858	1,986	1,494	999
Parry Sound.....	528	468	640	122	196	281	60
Patricia.....	1,198	1,064	1,725	1,273	2,560	3,089	2,043
Porcupine.....	958	2,440	2,147	1,803	2,296	1,578	1,425
Port Arthur.....	12,355	8,362	5,791	4,265	3,833	3,549	2,823
Red Lake.....	1,570	1,569	1,345	1,843	3,081	1,859	1,342
Sault Ste. Marie.....	9,436	9,362	4,570	2,203	2,004	1,020	1,284
Sudbury.....	6,326	9,821	8,160	4,036	4,409	2,245	1,949
Timiskaming.....	1,352	4,012	2,996	2,132	1,094	1,507	1,577
Total.....	45,940	54,332	39,548	26,395	30,717	21,701	18,917

⁽¹⁾Handled by the office of the Patricia Mining Division since 1 April 1956.

Principal Mining Areas of the Province of Ontario



Keys to Symbols

Ag — Silver	Gyp — Gypsum	Se — Selenium
Asb — Asbestos	Mg — Magnesium	Si — Silica
Au — Gold	Ne — Nepheline syenite	Te — Tellurium
Co — Cobalt	Ni — Nickel	Th — Thorium
Cu — Copper	Pb — Lead	U — Uranium
Fe — Iron	Pd — Palladium	Zn — Zinc
Fl — Fluorspar	Pt — Platinum	

STATISTICS AND MINING OPERATIONS

Metallics

BISMUTH

No bismuth was recovered in 1962. In past years it has been obtained in the processing of ores from the silver-cobalt mines in the Timiskaming district.

CALCIUM—*see* MAGNESIUM AND CALCIUM

COBALT—*see* NICKEL AND COPPER *and* SILVER AND COBALT

COPPER—*see* NICKEL AND COPPER

GOLD

In 1962 there were 29 gold mines operating in Ontario. One of these is a new operation. The mines reported milling 8,441,064 tons of ore, from which were recovered 2,355,096 ounces of gold and 397,200 ounces of silver for a total value of \$88,565,792. The average recovery per ton of ore milled was \$10.49. In the operations of the nickel-copper mines there was a recovery of 55,922 ounces of gold, and in the operations of the base metal mines 10,231 ounces were recovered. Thus the total production of gold was 2,421,249 ounces valued at \$90,578,924. This was a decrease of 8.20 percent in quantity and 3.16 percent in value from the 1961 production. The average price of gold rose from \$35.46 per troy ounce in 1961 to \$37.41 in 1962.

The gold mines paid \$6,955,393 to 1,211 salaried employees and \$38,090,056 to 9,678 wage-earners. They used fuel and electricity worth \$4,621,760 and process supplies worth \$14,507,397.

DIVIDENDS AND BONUSES PAID BY GOLD-MINING COMPANIES, BY AREAS

Year	Porcupine	Kirkland Lake, Larder Lake, and Sudbury	Northwestern Ontario	Total
1912-1957.....	\$330,290,987	\$284,680,701	\$57,159,131	\$672,130,819
1958.....	6,828,268	4,963,127	3,083,764	14,875,159
1959.....	14,313,084	5,052,304	3,341,028	22,706,416
1960.....	7,395,037	5,099,131	3,427,517	15,921,685
1961.....	7,540,668	4,950,034	3,347,096	15,837,798
1962.....	8,192,173	5,451,358	3,586,588	17,230,119
Total.....	\$374,560,217	\$310,196,655	\$73,945,124	\$758,701,996

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GOLD PRODUCTION, 1962

Areas and Mines	Rated Daily Mill Capacity	Daily Operating Average	Ore Milled	Bullion Recovered		Total Value of Bullion Canadian Dollars		
				Gold Content			Silver Content	
				Quantity	Value		Quantity	Value
PORCUPINE	tons	tons	tons	ounces	Value	ounces	Value	\$
Aunor	750	750	274,024	81,971	\$ 3,066,535	5,869	6,837	\$ 3,073,372
Broulan Reef	700	394	105,883	14,786	553,144	1,185	1,381	554,525
Delnite	520	496	181,144	48,827	1,826,618	3,682	4,289	1,830,907
Dome	1,975	1,975	714,500	172,118	6,438,934	38,346	44,673	6,483,607
Hallnor	400	351	128,347	35,859	1,341,485	2,157	2,513	1,343,998
Hollinger	3,900	2,875	1,049,369	269,200	10,070,772	57,720	67,244	10,138,016
Hugh-Pam	milled at Broulan Reef		37,942	4,805	179,755			179,755
McIntyre	2,400	1,981	723,120	223,039	8,343,889	35,983	41,920	8,385,809
Pamour	1,750	1,733	632,679	62,138	2,324,583	9,007	10,493	2,335,076
Paymaster	750	432	157,992	32,236	1,205,949	7,294	8,497	1,214,446
Preston	800	552	201,440	40,502	1,515,180	4,443	5,176	1,520,356
Ross	450	382	139,506	19,627	734,246	44,119	51,399	785,645
Total	14,395	11,921	4,345,946	1,005,108	\$37,601,090	209,805	\$244,422	\$37,845,512
KIRKLAND LAKE								
Lake Shore	1,200	796	141,075	52,243	\$1,954,411	27,983	\$ 32,600	\$ 1,987,011
Macassa	500	382	139,618	60,723	2,271,647	8,939	10,414	2,282,061
Teck-Hughes	650	363	132,440	24,386	912,280	3,560	4,147	916,427
Upper Canada	550	562	205,057	60,259	2,254,289	29,020	33,808	2,288,097
Wright-Hargreaves	milled at Lake Shore		149,384	51,720	1,934,845	15,157	17,658	1,952,503
Total	2,900	2,103	767,574	249,331	\$9,327,472	84,659	\$ 98,627	\$ 9,426,099
LARDER LAKE								
Kerr-Addison	4,000	3,405	1,242,933	422,263	\$15,796,859	25,528	\$ 29,740	\$15,826,599
SUBBURY								
Renabie	550	542	198,019	35,735	\$1,336,846	12,073	\$ 14,065	\$ 1,350,911
PATRICIA PORTION OF KENORA								
Campbell Red Lake	700	704	257,141	160,223	\$5,993,942	12,999	\$ 15,144	\$6,009,086
Cochenour Willans	275	274	100,001	75,936	2,840,766	4,330	5,044	2,845,810

Dickenson.....	470	481	175,767	89,884	3,362,560	7,998	9,318	3,371,878
Madisen Red Lake.....	800	853	311,705	100,899	3,774,632	17,481	20,365	3,794,997
McKenzie Red Lake.....	235	217	79,035	18,522	692,908	5,252	6,119	699,027
Pickle Crow.....	400	306	111,781	40,328	1,508,670	4,110	4,788	1,513,458
H. G. Young.....	425	323	117,845	21,868	818,082	2,357	2,746	820,828
Total.....	3,305	3,158	1,153,275	507,660	\$18,991,560	54,527	\$ 63,524	\$19,055,084
THUNDER BAY								
Consolidated Mosher.....	milled at M-Cockshutt		462,841	63,206	\$2,364,536	6,179	\$ 7,199	\$ 2,371,735
Leitch.....	120	92	33,757	47,962	1,794,258	1,992	2,320	1,796,578
MacLeod-Cockshutt.....	1,900	1,916	236,719	21,560	806,560	2,108	2,456	809,016
Total.....	2,020	2,008	733,317	132,728	\$4,965,354	10,279	\$ 11,975	\$ 4,977,329
SUNDRIES								
Clean-up, abandoned operations etc.....				2,271	\$ 84,959	329	\$ 385	\$ 85,342
Total for Gold Mines.....	27,170	23,137	8,441,064	2,355,096	\$88,104,140	397,200	\$462,738	\$88,565,792
Nickel-Copper refining.....				55,922	\$2,092,042			
Base metal mines.....				10,231	382,742			
Total Gold Production, 1962.....				2,421,249	\$90,578,924			

GOLD PRODUCTION, 1961

Porcupine.....			4,517,952	1,075,148	\$38,124,748	208,508	\$196,539	\$38,321,287
Kirkland Lake.....			930,737	301,156	10,678,991	90,992	85,769	10,764,760
Larder Lake.....			1,490,319	520,868	18,469,979	29,309	27,627	18,497,606
Sudbury.....			200,215	37,934	1,345,140	10,971	10,341	1,355,481
Patricia Portion of Kenora.....			1,151,333	523,462	18,561,963	56,282	53,051	18,615,014
Thunder Bay.....			731,017	110,081	3,903,472	8,543	8,053	3,911,525
Sundries.....				860	30,497	88	83	30,580
Total for Gold Mines, 1961.....			9,021,573	2,569,509	\$91,114,790	404,693	\$381,463	\$91,496,253
Nickel-Copper refining.....				58,769	\$ 2,083,948			
Base metal mines.....				9,442	334,813			
Total Gold Production, 1961.....				2,637,720	\$93,533,551			

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Aunor Gold Mines Limited

Aunor Gold Mines Limited was incorporated in May 1939, with an authorized capitalization of 2,000,000 shares of \$1 par value, all of which have been issued. The directors and officers were: J. R. Bradfield, president and director; W. S. Row, vice-president and director; R. V. Porritt, N. C. Urquhart, and K. C. Gray, directors; C. H. Windeler, secretary; R. G. Rudolf, treasurer. The head office is at 1700, Bank of Nova Scotia Building, Toronto. The mine address is Box 2001, Timmins.

The company's property consists of eleven claims in Deloro township, Porcupine area, District of Cochrane.

Mining and milling continued throughout 1962.

SHAFTS, AUNOR MINE

	Claim No.	Inclination	Number of Compartments	Depth Below Surface
No. 1 shaft.....	H.S. 850	Vertical	3	feet 3,082
No. 2 (service winze below 2,110 ft.)...	T.R.S.828	62°	2	2,907

Development work consisted of 1,377 feet of drifting and 56 feet of cross-cutting. The total corrected development footage to 31 December 1962 was as follows: 71,214 feet of drifts, 13,407 feet of crosscuts, 32,944 feet of raises.

New levels were established at the 3,100- and 3,300-foot horizons in Aunor ground from the Delnite No. 3 winze. A loading-pocket was established below the Delnite 4,000-foot level to complete an Aunor ore-pass system that extends downward from the Aunor 2,900-foot level—all in Delnite ground.

The yearly and accumulated total of Aunor development on Delnite ground appears under Delnite Mines Limited in this report. Diamond-drilling in 1962 consisted of 458 holes, totalling 34,137 feet, from underground.

New added equipment included the following:

- 4 slushers (Joy FF 211, Joy Mfg. Co. Canada Ltd., Kirkland Lake).
- 2 silicon rectifiers (Powertronic, Mancha Locomotive, North Bay).
- 1 locomotive (complete with Titan ANX battery, Mancha Locomotive, North Bay).
- 3 loaders (Eimco, Noranda Mines Ltd., Noranda, Que.).
- 2 batteries (20 TLF 15, Electric Storage Battery Co.).

The following is taken from the company annual report for the year ending 31 December 1962:

Mining

Mining was continued between the 1,500- and 2,900-foot levels.

Ore extraction amounted to 273,400 tons with an average grade of 0.31 ounces of gold per ton; this compares with 277,000 tons averaging 0.33 ounces per ton in 1961. About 4 percent of the ore came from above the 2,125-foot horizon.

Development

Development above the 2,900-foot level was directed toward extension of the known ore zone and its preparation for mining.

By agreement with Delnite Mines Limited, all work below the 2,900-foot horizon was done by Aunor crews working through the Delnite shafts.

On the 3,100-foot level, an entry from the Delnite No. 3 shaft was established, and a drift was advanced to a point 350 feet east of the boundary into the downward extension of the ore zone. Similarly on the 3,300-foot level, a drift has been advanced 190 feet east of the boundary.

Diamond-drilling on these levels continues to indicate ore-making conditions similar to those above the 2,900-foot level.

Ore Reserves

At the year's end the proven ore reserves were 1,182,000 tons averaging 0.34 ounces of gold per ton.

Compared with 273,400 tons mined, 277,400 tons of new ore was proved, all in the block between the 2,125- and the 2,900-foot levels.

Mill

The following tabulation provides mill production and performance figures for the year, as compared with 1961 and with the period since production commenced in January 1940.

	1962	1961	Total to Date
Milled..... tons	274,000	278,700	4,307,300
Milled per calendar day..... tons	750	765	515
Average gold content..... oz. per ton	0.314	0.326	0.352
Average tailings loss..... oz. per ton	0.014	0.016	0.011
Total recovery..... percent	95.4	95.3	96.7
Total production..... oz. gold	81,970	86,930	1,466,930
Value of total production.....	\$3,072,200	\$3,088,900	\$52,644,500
Recovery per ton.....	\$11.20	\$11.10	\$12.20

The average number of employees was 419: 302 underground and 117 on surface. R. E. Findlay was manager.

Broulan Reef Mines Limited

Broulan Reef Mines Limited was incorporated in June 1951, with an authorized capitalization of 6,000,000 shares of \$1 par value, of which 5,961,142 shares have been issued. The directors and officers were: H. F. Brownbill, president and director; W. H. Maedel, vice-president, secretary-treasurer and director; F. G. Lawson, vice-president and director; L. B. Harder, D. G. Lawson, G. A. MacMillan, and Mrs. V. R. MacMillan, directors. The head office is at Room 1702, 80 Richmond Street West, Toronto 1. The mine address is Pamour.

The company owns the Broulan Reef mine and the old Bonetal and Bonwhit mines, consisting of eighty-one claims, in Whitney, Murphy, and Tisdale townships, Porcupine area, District of Cochrane. It also operates the property of Hugh-Pam Porcupine Mines Limited in the same group, which is further included in this report under that heading. No work has been done for a number of years in the Broulan, Bonetal, or Banner sections of the property.

Work in the Reef section and the Hugh-Pam property continued throughout 1962. All operations were conducted through the Reef No. 1 shaft, in the north-east quarter of the south half of lot 10, concession V, Whitney township (claim P.13091). The vertical, three-compartment shaft is 2,556 feet deep. The vertical, two-compartment, No. 1A winze collared at 2,500 feet, was sunk 97 feet in 1962 to a total depth of 2,637 feet below surface. The 2,540-foot level was established 40 feet below the collar.

Development work in 1962 included: drifting, 2,225 feet; crosscutting, 615 feet; raising, 2,100 feet. Total development footage to 31 December 1962 was as follows: drifts, 37,966 feet; crosscuts, 12,374 feet; raises, 17,438 feet. Diamond-drilling during the year consisted of 31 holes, totalling 11,067 feet, from underground.

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The following is taken from the company annual report for the year ending 31 December 1962:

Ore Reserves

Proven ore reserves at the Broulan Reef mine are calculated to be 109,000 tons, having an average uncut grade of 0.31 ounces of gold per ton or a grade cut to 1 ounce of 0.21 ounces per ton.

Milling and Production

During the year, the mill treated a total of 143,827 tons of ore from the Broulan Reef and Hugh-Pam mines, for a daily average of 394 tons, from which was recovered 19,591.368 ounces of fine gold and 1,185.19 ounces of silver. Recovery averaged 95.8 percent.

A total of 105,883 tons of ore was mined and milled from the Broulan Reef mine, producing 14,786.387 ounces of fine gold valued at \$554,522.43 and 1,185.19 ounces of silver valued at \$1,385.05. In addition \$149,737.62 was claimed under the terms of the Emergency Gold Mining Assistance Act. Average recovery was 0.140 ounces of gold or \$5.24 per ton milled based on the Mint price, plus an additional \$1.41 per ton milled under the Emergency Gold Mining Assistance Act.

General

Exploration and development work produced 16,081 tons of waste rock, which was broken and hoisted; 47,275 cubic yards of sand fill was delivered underground.

Operating costs for 105,883 tons of ore mined and milled during the year from the Broulan Reef mine, including head office administration and general expense, amounted to \$8.97 per ton.

The average number of employees was 161: 91 underground and 70 on surface. H. V. Pyke was mine manager.

Campbell Red Lake Mines Limited

Campbell Red Lake Mines Limited was incorporated in August 1944, with an authorized capitalization of 4,000,000 shares of \$1 par value, of which 3,999,500 shares have been issued. The company is controlled by Dome Mines Limited. The directors and officers were: C. W. Michel, chairman of the board; J. B. Redpath, president and director; C. C. Calvin, vice-president, secretary and director; W. F. James, and J. K. McCausland, directors; E. J. Andrecheck, treasurer. The head office is at Suite 904, 50 King Street West, Toronto 1. The mine address is Balmertown.

The company owns 27 claims, about 1,175 acres, in Balmer township, Red Lake area, District of Kenora (Patricia Portion).

Mining and milling continued throughout 1962.

The vertical, four-compartment No. 1 shaft, located on claim K.R.L.20071, is 3,281 feet in depth below the collar.

Development work in 1962 was as follows: 9,029 feet of drifting; 2,075 feet of crosscutting; 4,300 feet of raising. Total development to 31 December 1962 was as follows: 128,551 feet of drifts; 23,153 feet of crosscuts; 36,502 feet of raises. Diamond-drilling in 1962 included: 3 holes, totalling 6,202 feet, from surface; and 291 holes, totalling 40,388 feet, from underground.

The following is taken from the company annual report for the year ending 31 December 1962:

Mining

Broken ore totalling 241,200 tons remains in the stopes, a decrease of 6,800 tons from the previous year.

In all, 210,763 tons of a grade of 13.68 pennyweight was drawn from the stopes and sent to the mill.

All major stoping operations were above the 10th level or 1,450-foot horizon.

Two stopes are now being mined by the cut-and-fill type of mining. In future an increasing amount of mining will be done by this method.

Ore Production

The mine produced 257,141 tons of ore during the year averaging 13.39 pennyweight. The stopes produced 210,763 tons averaging 13.68 pennyweight, and development work produced 46,378 tons averaging 12.04 pennyweight.

Ore Reserves

The ore reserves are estimated at 1,131,600 tons, an increase of 1,900 tons over last year. The ore reserves include 241,200 tons of broken ore, a decrease of 6,800 tons from last year.

A summary of the distribution of ore in place, broken ore, and total ore extracted from stopes to the end of 1962 is as follows:

SUMMARY OF ORE RESERVES AND EXTRACTION BY LEVELS

Level	Ore in Place	Average Grade	Broken Ore	Total Ore Extracted from Stopes to End of 1962
	tons	dwt. per ton	tons	tons
Surface to 1st.....	9,300	11.76	—	243,390
1st to 2nd.....	20,400	11.91	—	292,328
2nd to 3rd.....	36,600	10.36	—	262,631
3rd to 4th.....	44,300	8.68	6,000	362,006
4th to 5th.....	39,400	11.79	59,000	328,210
5th to 6th.....	115,800	13.41	61,500	283,402
6th to 7th.....	109,200	13.76	23,000	243,738
7th to 8th.....	40,800	12.73	39,500	192,358
8th to 9th.....	56,100	11.56	5,700	143,638
9th to 10th.....	50,500	13.66	36,100	34,716
10th to 11th.....	78,600	12.53	300	749
11th to 12th.....	60,500	11.69	8,400	6,763
12th to 13th.....	100,100	14.84	300	1,098
13th to 14th.....	128,800	15.32	1,400	2,528
Total of Average.....	890,400	13.09	241,200	2,397,555

Mill

The following are the results of milling operations:

Ore treated.....	tons	257,141
Average per calendar day.....	tons	704
Average grade of ore treated.....	dwt. per ton	13.39
Recovery.....	dwt. per ton	12.39
Recovery.....	percent	92.52

Costs

The expenditure on mining was \$835,334 or \$3.25 per ton milled.

The expenditure on development (including work done by H. G. Young Mines Ltd.) was \$719,730, or \$2.80 per ton milled.

Operating costs (including the above-mentioned item) were \$9.63 per ton milled.

General

A slightly lower mill recovery resulted from the periodic occurrence of more refractory ore in the mill feed. In an endeavour to increase extraction, continual mineralogical and metallurgical study is carried on.

Three heating seasons have now definitely proved the substantial savings that have resulted from the installation of new boilers, which allow the use of Bunker C oil fuel.

Rock-breaking efficiency has been increased by the use of ammonium nitrate blasting agents.

Costs were unfavourably affected primarily by wage increases, also to a lesser extent by additional exploratory development work on the north claims, and also by the driving of ore and waste passes on the lower levels.

The average number of employees was 278: 145 underground and 133 on surface. Joseph Chisholm was general manager.

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Cochenour Willans Gold Mines Limited

Cochenour Willans Gold Mines Limited was incorporated in April 1936, with an authorized capitalization of 3,000,000 shares of \$1 par value, of which 2,974,655 shares have been issued. The directors and officers were: E. C. Cochenour, president and director; W. M. Cochenour, vice-president and director; J. E. J. Fahlgren, vice-president, manager, and director; F. J. Mills, secretary-treasurer and director; M. C. Mosher and R. M. Elliot, directors; C. V. Maltby, assistant secretary. The head office is at 150 Eglinton Avenue East, Toronto 12. The mine address is Cochenour.

The property consists of 49 claims in Dome township, Red Lake area, District of Kenora (Patricia Portion).

Mining and milling continued throughout 1962.

SHAFTS, COCHENOUR WILLANS MINE

Shaft	Claim No.	Inclination	Number of Compartments	Depth below Surface
No. 1.....	K.R.L.322	Vertical	3	feet 2,246
No. 2.....	K.R.L.462	Vertical	3	446

Development work in 1962 consisted of the following: drifting, 7,560 feet; crosscutting, 5,332 feet; raising, 4,344 feet. Development footage to 31 December 1962 was as follows: 93,316 feet of drifts; 70,672 feet of crosscuts; 56,987 feet of raises. Diamond-drilling in 1962 consisted of 631 holes, totalling 85,251 feet, from underground; also 56 holes, totalling 25,042 feet, from underground for Wilmar Mines Limited.

New construction included a boiler-house as an addition to the compressor building (Butler Building). Permanent water and sewer lines were laid.

Equipment added in 1962 included the following:

- 1 Hough Payloader (with bucket, backhoe, etc., H70-20AH-1272).
- 1 steam boiler (Chromalox, series 1800, 3-phase, 1,800-kw., 120-bhp, Northern Electric).

The following is taken from the company annual report for the year ending 31 December 1962:

Production and Costs

During the year, 171,920 tons were hoisted of which 100,001 tons were ore, and 71,919 tons were waste (including waste from the Marcus and Wilmar drives). Mining produced 93,048 tons of the ore milled, and the balance of 6,953 tons came from development.

The 100,001 tons of ore milled yielded a recovery of 75,936 ounces of gold and 4,330 ounces of silver. The total value of this bullion was \$2,862,137 for an average of \$28.64 per ton milled. The average price received for gold (\$37.624) was higher than the previous year by \$1.939 per ounce.

Daily tonnage milled was increased during 1962 by 10 tons per day to an average for the year of 274 tons. The mining operations were expanded to explore, develop, and mine overlooked blocks and remnants of lower-grade ore in the upper levels now, while rail and pipe installed in these areas continued to be usable.

The James concentrating table introduced to upgrade and reduce the quantity of concentrate to amalgamation proved very successful by greatly reducing consumption of mercury and labour.

The use of ammonium nitrate and fuel oil (AN/FO) as blasting agent, replacing conventional dynamite, resulted in appreciable savings.

Installation of an underground compressor for boosting air pressure for long drives, supplies a constant air pressure.

Installation of a new electric boiler in the central heating plant to replace the wood boiler, has reduced cost of heating.

Installation of a new Ty-Rod screen in the crusher-house has reduced size of feed to the ball mill.

COST PER TON MILLED

	Total	1962	1961	1960	1959	1958
Development	\$ 407,679	\$ 4.077	\$ 4.863	\$ 4.836	\$ 4.965	\$ 4.158
Mining	628,303	6.283	6.120	5.955	5.967	6.206
Milling	310,466	3.105	3.367	3.136	2.990	2.832
General and administrative	232,218	2.322	2.584	2.585	2.755	2.744
Marketing	21,195	0.212	0.186	0.194	0.177	0.234
Total Costs	\$1,599,861	\$15.999	\$17.120	\$16.706	\$16.854	\$16.174
Milled tons	—	100,001	96,155	90,010	84,004	77,804

Mining

The mill feed was supplied from the mining of 92 stopes, which produced 93,048 tons of ore averaging 0.830 ounces gold per ton, and 57 development places, which produced 6,953 tons averaging 0.547 ounces per ton.

The occurrence of the ore deposits, severely faulted and offset, precludes any attempt to estimate ore reserves with accuracy. Development on the new horizons continues favourably.

Milling and Metallurgy

There has not been any great change in the mineralization of the ore milled from the previous year, except that talcose ore is more prevalent.

In order to increase tonnage and to facilitate more efficient performance of the wet cyclone in the grinding circuit, a 4- by 10-foot, single-deck rod screen was purchased and installed, together with a second Newhouse cone-crusher. By adding this equipment a reduction of size to about 3/4 inch is now being fed to the ball mill.

The operation of the James concentrating table purchased last year has been most satisfactory. This machine upgrades and reduces the quantity of concentrate sent to amalgamation; and an appreciable cost saving in this operation was realized—about 48 percent.

Results of the milling operations are set out in the following summary, which includes similar figures for the previous four years.

SUMMARY OF MILLING OPERATIONS

	1962	1961	1960	1959	1958
Milled tons	100,001	96,155	90,010	84,004	77,804
Operating time percent	98.63	98.90	99.18	99.02	99.16
Average milled daily tons	274	264	245.9	230.1	213.2
Average gold assay of heads oz. per ton	0.8110	0.8759	0.8627	0.8534	0.8726
Average gold assay of tails oz. per ton	0.0510	0.0537	0.0429	0.0479	0.0629
Extraction percent	93.69	93.87	95.03	94.39	92.79

Exploration

(Wilmar Exploration)

The three gold-bearing structures discovered and reported on, in 1961, are known as: the Agglomerate Zone; the Carbonate Zone; and the Diorite Zone. These structures have been further explored and developed; they will be discussed separately.

During 1962 the greater proportion of the diamond-drilling program was carried out from the east drive. This drilling substantially extended the Agglomerate Zone from the 1,300-foot level down to the 2,000-foot level horizon, where better intersections were obtained. Intermittently, good intersections indicate a strike length of at least 600 feet. This zone is still significantly open in most directions.

Two development drifts were driven on the 1,300-foot level to explore part of the lengths of the Agglomerate and Carbonate zones. The developed part of the Agglomerate Zone follows a mineralized fault breccia zone that strikes about N.80°E. and dips about 65° to the south with an indicated rake to the west. The mineralization in this vein was found to carry fine tellurides of

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silver and gold with associated visible chalcopryrite; visible gold is rare. The gold:silver ratio was found to be about 1 ounce gold to 12 ounces silver. Face-chip samples of the 152 feet of vein developed average 0.62 ounces gold (cut) and 7.4 ounces silver over an average width of 5.1 feet. This structure has subsequently been extended to the west by 50 feet. Some 200 feet farther to the east, the good mineralization of a second lens has been located on the 1,300-foot level horizon in an above-average-grade diamond-drill intersection.

The developed part of the faulted carbonate zone located two well-mineralized blocks. One, a shear following carbonate, was heavy in visible gold. Face-chip samples indicate a grade of 1.38 ounces gold and 16.5 ounces silver over an average width of 1.3 feet and a length of 30 feet. On the second block of carbonate, face-chip sample assays averaged 0.55 ounces gold and 6.6 ounces silver over an average width of 9.2 feet for a length of 33 feet. Gold-silver tellurides and chalcopryrite mineralization similar to the Agglomerate Zone occurs, but visible gold is more prevalent.

The fractured and mineralized diorite dike tops some 300 feet below the 1,300-foot level. The mineralization is essentially coarse visible gold in narrow quartz-filled fractures. The diamond-drilling has served to locate the dike and gold mineralization. The potential tonnage of the mineralized dike may be large; widths of 12 feet and over were intersected, and the traced length is nearly 1,000 feet. Any reliable assessment of grade requires development and bulk-sampling methods. This structure has been intersected at the 2,000-foot horizon; therefore the advance of the 2,050-foot level into the diorite will provide the development and sampling base required.

The advance of the work on the Cochenour west zone indicates that by projecting the favourable rocks, part of the hanging-wall zone should dip across the boundary into the Wilmar. It has therefore been decided to advance the south crosscut on the 2,050-foot level across the boundary into Wilmar, and at a point of roughly 300 feet within the Wilmar property, drive a branch drift to the west for 1,000 feet to establish bases for diamond-drill exploration.

(Consolidated Marcus Exploration)

The 1,300-foot level Marcus drive continued without abatement during 1962, and this drive was extended 4,051 feet along Keewatin lavas. At the year's end the drive was 5,199 feet past the Cochenour boundary and about 100 feet short from the turn to its planned 4,000-foot-long north-east leg. The line drive crossed a carbonate vein structure in virgin ground. This vein associated with an interflow iron formation carried up to half ounce gold over widths up to 1.3 feet.

The northeast leg of the Marcus drive will cut across the rock trends and also cross the projections of the three gold-bearing zones picked up by surface drilling. The original objective of the drive should be completed in 1963.

Immediately the drive is completed, the diamond-drilling program will commence.

The average number of employees was 204: 103 underground, and 101 on surface. J. E. J. Fahlgren, vice-president, was general manager.

Consolidated Mosher Mines Limited

New Mosher Longlac Mines Limited was incorporated in June 1950, to succeed Mosher Long Lac Gold Mines Limited. In February 1954 the name was changed to Consolidated Mosher Mines Limited. At the same time the authorized capitalization was changed from 5,000,000 shares of \$1 par value to 5,000,000 shares of \$2 par value; 3,262,810 shares have been issued. The directors and officers were: J. G. Boeckh, president and director; P. K. Hanley, vice-president and director; J. C. L. Allen, executive vice-president and director; R. C. Stanley Jr., and S. J. Bird, directors; Miss B. A. Argo, secretary. The head office is at 199 Bay Street, Toronto 1. The mine address is Geraldton.

The main property comprises twenty claims west of the MacLeod-Cockshutt mine in Errington township, District of Thunder Bay. The company also owns the former Hard Rock property, comprising seventeen claims in Errington township.

Operations at the main property continued throughout 1962. The mine has been developed through a vertical, three-compartment shaft, 2,530 feet deep, known as the No. 1 or Mosher, on claim T.B.10046. In 1957 a second four-compartment shaft, No. 2, was collared to a depth of 52 feet, on claim T.B.10065, about 3,000 feet west of No. 1 shaft.

Development work in 1962 consisted of 1,057 feet of drifting, 300 feet of crosscutting, and 614 feet of raising. Total corrected development footage to 31 December 1962 was as follows: 11,354 feet of drifts; 6,951 feet of crosscuts; 3,995 feet of raises. Diamond-drilling in 1962 consisted of 35 holes, totalling 6,958 feet, from underground.

New construction consisted of a power substation (55 x 14 ft.) on surface, concrete foundations, and frame construction.

The following is taken from the company annual report for the year ending 31 December 1962:

The mine was first brought into production in January 1962, and under the terms of the agreement with MacLeod-Cockshutt Gold Mines Limited, a total of 462,841 tons was milled during the year. Revenue from this production was \$2,384,858, or \$5.15 per ton. In addition it is estimated \$506,500 will be received from E.G.M.A. increasing total revenue to \$2,891,358 or \$6.25 per ton.

Ore reserves remaining above the 2,040-foot level at the year's end were 2,094,585 tons averaging 0.127 ounces per ton, of which 1,566,045 tons are in stopes and 528,540 tons in pillars. Production in 1963 is scheduled to average 1,500 tons per day.

Preparations for sinking have been almost completed at the new underground shaft site. A (48 x 96 in.) double-drum hoist is being installed, and tenders have been called for 1 April. This shaft, designated as No. 3 shaft will be collared at the 2,040-foot level, 3,000 feet west of No. 1 shaft, and will be sunk 950 feet, to establish six levels at approximately 150-foot intervals. Closely spaced diamond-drilling from these levels will provide information for an estimate of the ore reserves down to the 2,940-foot horizon.

No additions were made to No. 1 shaft plant, except that a steel water tower was moved from the Hard Rock mill site to provide fire protection. Much of the equipment and supplies at the Hard Rock site is being used at Mosher, and the equipment that will not be used is being sold.

H. E. Rudd was general manager, and the operation was carried on by the MacLeod-Cockshutt organization.

Delnite Mines Limited

Delnite Mines Limited was incorporated in October 1934, with an authorized capitalization of 3,000,000 shares of \$0.80 par value, of which 2,978,767 shares have been issued. The directors and officers were: W. V. Moot, president and managing director; Whitworth Ferguson and K. C. Gray, vice-presidents and directors; W. S. Walton, secretary-treasurer and director; W. L. Marcy, F. R. Burton, and A. F. Osborn, directors. The address of both the head office and mine office is Box 590, Timmins.

The property consists of eight claims in Deloro township, Porcupine area, District of Cochrane, 3 miles southeast of Timmins.

Mining and milling continued throughout 1962.

SHAFTS, DELNITE MINE

Shaft	Claim No.	Inclination	Number of Compartments	Collar Depth	Depth from Surface
No. 1	T.R.S.825	Vertical	2 (inactive)	feet nil	feet 391
No. 2	T.R.S.825	Vertical	3	nil	3,031
No. 3	—	Vertical	4	2,888	5,395

The 3,100- and 3,300-foot levels were established in No. 3 shaft, at depths of 211 and 421 feet below the collar.

Development work in 1962 included: 2,577 feet of drifting; 1,367 feet of crosscutting; and 3,568 feet of raising. Total development footage to 31 December

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1962 was as follows: 92,815 feet of drifts; 47,048 feet of crosscuts; 58,366 feet of raises. Development work completed by Aunor mine in Delnite ground in 1962 included: 1,802 feet of drifting; 45 feet of crosscutting; and 1,461 feet of raising. The total amount of this development to 31 December 1962 was as follows: 1,922 feet of drifts; 45 feet of crosscuts; 1,461 feet of raises. Diamond-drilling in 1962 consisted of 209 holes, totalling 17,307 feet, from underground.

The following was additional equipment in 1962:

- 1 triplex pump (4- x 6-in.).
- 1 hoist (HNN-1K, Canadian Ingersoll-Rand).
- 6 mine cars (capacity 35 cu. ft.).

The following is taken from the company annual report for the year ending 31 December 1962.

Production

Ore treated..... tons	181,144
Gross value	\$1,996,980
Bullion recovered:	
Gold—50,039.143 oz. at \$37.47 per oz.....	\$1,875,048
Silver—3,767.26 oz. at \$1.17 per oz.....	\$ 4,393
Total value	\$1,879,441
Value per ton.....	\$ 11.03
Recovery per ton.....	\$ 10.38
Recovery..... percent	94.11

Broken Ore Reserves

Broken ore reserves are estimated at 8,391 tons.

Costs

	Total Cost	Cost per Ton Milled		Cost per Ounce Gold Produced 1962
		1962	1961	
OPERATING COSTS (before cost-aid)				
Development and exploration	\$ 82,583	\$ 0.46	\$ 0.43	\$ 1.65
Mining	1,222,784	6.75	6.47	24.44
Milling	301,373	1.66	1.65	6.02
General mine charges after deducting sundry revenue.....	221,369	1.22	0.89	4.42
Administrative expense (partly mine)	58,166	0.32	0.29	1.16
Bullion marketing expense, including Mint handling and refining charges.....	12,360	0.07	0.06	0.25
Total.....	\$1,898,635	\$10.48	\$ 9.79	\$37.94
OTHER COSTS				
Depreciation	\$ 16,662	\$ 0.09	\$ 0.09	\$ 0.33
Shaft-sinking and development write-off	36,864	0.20	0.23	0.74
Provision for Ontario mining taxes.....	15,864	0.09	0.04	0.32
Outside exploration	546	0.01	0.02	0.01
Total.....	\$ 69,936	\$ 0.39	\$ 0.38	\$ 1.40
Total Costs.....	\$1,968,571	\$10.87	\$10.17	\$39.34

Development

A total of 780 feet of drifting on the bottom five levels of the mine developed 252 feet of ore. Subdrifting from stopes and box-holes developed an additional 785 feet of ore.

The exploration drive on the 4,975-foot level, started in 1961 to test the south ore zone at depth, was driven another 869 feet. Due to a closure of the ore zone by a massive body of talc-chlorite schist, it was discontinued. A few interesting veins were encountered and explored by diamond-drilling and drifting, but no ore was developed or indicated.

Mining

Stoping was done on eleven levels, all of which were in the No. 3 shaft area.

Depth of mining and concentration of working places again accounted for a slight decrease in productivity. By the year's end, eighty percent of the ore reserves was concentrated on the three levels below the 4,875-foot horizon.

Milling

The mill operated continuously throughout the year at an average daily rate of 496 tons, as compared with 502 tons for the operating period in 1961.

A further improvement in extraction of a little over one percent raised the percent recovery to 94.1.

General

At the request of, and for the account of Aunor Gold Mines Limited, Delnite constructed a loading pocket, and drove 68 feet of ore-pass at the 4,000-foot level of Delnite's No. 3 shaft.

The average number of employees was 267: 190 underground, and 77 on surface. G. A. Vary was general manager.

Dickenson Mines Limited

Dickenson Red Lake Mines Limited was incorporated in November 1944; in June 1947 the capitalization was increased; in June 1949 the company was reorganized, and the name changed to New Dickenson Mines Limited; in October 1960 the name was changed to Dickenson Mines Limited on amalgamation of New Dickenson Mines Limited and Lake Cinch Mines Limited. The authorized capitalization was 3,750,000 shares of \$1 par value of which 3,510,140 shares have been issued. The directors and officers were: A. W. White, president and director; C. R. Diebold, vice-president and director; F. A. Fell, general manager and director; R. A. Jodrey, S. C. Smith, M. L. Urquhart, and R. F. Rock, directors; H. R. Heard, secretary-treasurer; L. W. McIlmurray, assistant secretary; L. V. Barbisan, assistant-treasurer. The head office is at Suite 416, 25 Adelaide Street West, Toronto 1. The mine address is Balmertown.

The property comprises thirty-one claims in Balmer township, Red Lake area, District of Kenora (Patricia Portion).

Mining and milling continued throughout 1962.

SHAFTS, DICKENSON MINE

	Claim No.	Inclination	Number of Compartments	Total Depth from Surface
No. 1 shaft	K.R.L.19497	Vertical	3 to 8th level 4 to bottom 3	feet 3,589
Detta shaft (inactive)	K.R.L.19502	Vertical		280

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A total of 5,642 feet of drifting, 6,326 feet of crosscutting, and 3,685 feet of raising was completed. Total development footage to 31 December 1962 was as follows: 64,726 feet of drifts; 50,185 feet of crosscuts; 39,848 feet of raises. Diamond-drilling in 1962 consisted of 370 holes, totalling 66,847 feet, from underground and six holes, totalling 5,911 feet, from surface.

New construction in 1962 included an addition to the mine dry (12 x 40 feet) and an addition to the heating plant building (14 x 40 feet), both frame construction.

New equipment installed was as follows:

HEATING PLANT:

1 heating boiler (Chromalox electric CCH-750, 15-psi.).

MILL:

1 cyclone (Krebs D-15, in primary grinding circuit).

UNDERGROUND:

1 locomotive (Atlas Q, 3-ton, 24-in. gauge).

3 skip-over cage combinations (Kimberly aluminum, 60 cu. ft. Dorr-Oliver-Long).

9 slusher-hoists 6 (A5NN-OH), 3 (H5NN-1J), (Canadian Ingersoll-Rand).

1 slusher-hoist (Joy FF-211 double-drum).

15 mine cars (Hudson 50 cu. ft., side-dump).

4 loaders (Eimco 12B Rocker).

1 pump (Mather and Platt, Plurovane, 11 chambers).

3 trammers (Mancha type B, 24-in. gauge).

1 car loader (Gardner-Denver, GD-10H).

The following is taken from the company annual report for the year ending 31 December 1962.

Operating Costs

	1962			1961
	Total	Per Ton Milled	Per Ounce	Per Ounce
Shaft deepening.....	\$ 36,426	\$ 0.21	\$ 0.40	\$ 2.68
Exploration and development.....	411,588	2.34	4.55	4.54
Mining.....	761,328	4.33	8.41	7.56
Milling.....	454,846	2.59	5.03	5.18
Mine general expense.....	335,337	1.91	3.70	3.65
Head office expense.....	111,770	0.64	1.23	1.37
Marketing charges.....	20,618	0.12	0.23	0.22
Total.....	\$2,131,913	\$12.14	\$23.55	\$25.20

Mining

Broken ore totalling 128,263 tons remained in the stopes, a decrease of 15,464 tons from the previous year. Also, 3,237 tons remained in the ore bins and ore-passes at the year's end.

Of the 175,605 tons of ore hoisted, 26,569 tons grading 0.533 ounces per ton, was obtained from development; and 149,036 tons grading 0.509 ounces per ton, was obtained from stoping and stope preparation.

Stoping operations were carried on in the North C, South C, East South C, D, and F zones on the upper nineteen levels. Of the total ore hoisted, the percentages from the zones were: North C, 19.1 percent; South C, 32.8; East South C, 12.2; D, 16.0; F, 14.9; miscellaneous (E H and Robin), 5.0 percent.

During the year, five stopes were operating as cut-and-fill stopes, and six others were being prepared as cut-and-fill stopes using classified mill tailings as fill. The balance of the operating stopes used the "shrinkage" stope method of mining. Tons broken per rock-drill-shift in stopes and backstopes was 39.5, compared with 37.9 in 1961. The average stope width was 6.0 feet, compared with 5.6 feet the previous year.

Ore Reserves

At 31 December 1962, positive ore reserves, broken and in place, were calculated to be 576,717 tons having an average grade of 0.515 ounces of gold per ton. This compares with 467,550 tons grading 0.543 ounces per ton at 31 December 1961.

Milling

Summary of mill operations, with the previous year given as comparison is as follows:

	1962	1961
Treated tons	175,767	171,935
Operating time percent	99.03	98.44
Treated per day tons	481.6	471.1
Average mill heads oz. per ton	0.559	0.561
Mill tails oz. per ton	0.043	0.047
Recovery oz. per ton	0.516	0.514
Recovery percent	92.3	91.7

General

Operating costs at the mine are down \$0.76 per ton milled as compared with 1961, mainly due to a reduction of \$1.17 per ton in shaft-deepening expenses, and a \$0.45 per ton increase in mining costs.

Deeper mining has necessitated a gradual change from shrinkage stoping to the higher cost method of cut-and-fill stoping for the majority of stopes. The change to cut-and-fill will be complete by the end of 1964. The increase in mining costs is expected to be modified by a reduction in dilution and, therefore, a higher grade of ore. In addition, fresh or recently broken ore supplied to the mill is considered to have some bearing on the improved recovery in 1962, of approximately one percent. Experiments are in progress to determine to what extent cut-and-fill stoping is responsible for the increase in recovery. Mill recovery was improved from 91.7 percent in 1961 to 92.3 percent in 1962.

A program of line-cutting and surface prospecting on the Robin, the old Detta, and other properties southeast of the mine workings was started.

The average number of employees was 287: 162 underground, and 125 on surface. F. A. Fell was general manager.

Dome Mines Limited

Dome Mines Limited was incorporated in July 1923, to succeed Dome Mines Company Limited. The authorized capitalization is 2,000,000 shares of no par value, of which 1,946,668 shares have been issued. The directors and officers were C. W. Michel, chairman, treasurer, and director; J. B. Redpath, president and director; C. C. Calvin, vice-president, secretary, and director; W. R. Biggs, F. W. Pershing, A. T. Lambert, H. C. Brunie, A. B. Matthews, and W. F. James, directors. The head office and mine office address is South Porcupine. The secretary's office is at 36 Toronto Street, Toronto.

The company owns sixty-two claims and parts of the beds of Porcupine and Simpson lakes, in Tisdale, Whitney, Bond, and Shaw townships, Porcupine area, District of Cochrane.

Mining and milling continued throughout 1962.

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SHAFTS, DOME MINE

	Claim Number	Inclination	Number of Compartments	Collar Depth	Vertical Depth from Surface
No. 1 shaft.....	P.12866	Vertical	3 (inactive)	feet Surface	feet 105
No. 2 shaft.....	P.12864	Vertical	3 (inactive)	Surface	805
No. 3 shaft.....	P.12864	Vertical	4 to 10th level 6 below 10th level	Surface	2,456
No. 1 Dome extension.....	P.13191	Vertical			
No. 1 Foley-O'Brien.....	P.13403	Vertical	Inactive	Surface	70
No. 2 Foley-O'Brien.....	P.13403	Vertical	Inactive	Surface	160
No. 3 Foley-O'Brien.....	Lot 2, con. 2 Tisdale twp.	Vertical	Inactive	Surface	240
No. 1 Temiskaming.....	Lot 3, con. 2, Tisdale twp.	Vertical	Inactive	Surface	260
No. 2 Temiskaming.....	Lot 3, con. 2, Tisdale twp.	Vertical	Inactive	Surface	60
Foley-O'Brien winze.....	-----	70°	Inactive	160	250
No. 4 winze.....	-----	Vertical	Inactive	1,587	2,053
No. 5 winze.....	-----	Vertical	3	2,026	3,137
No. 6 internal.....	-----	Vertical	5	2,000	4,062
No. 7 winze.....	-----	Vertical	3	3,950	4,700

No. 7 winze was collared on the 29th level at 3,950-foot depth and was sunk 750 feet to a total depth of 4,700 feet below surface, at year's end 1962. Nos. 30, 31, 32, 33, and 34 levels are at depths of 150, 297, 444, 591, and 738 feet, respectively, below the winze collar.

Development work in 1962 included: 11,809 feet of drifting; 4,009 feet of crosscutting; 2,845 feet of raising. Total development footage to 31 December 1962 was as follows: 411,876 feet of drifts; 186,174 feet of crosscuts; 234,549 feet of raises. Diamond-drilling in 1962 consisted of 509 holes totalling 105,750 feet, from underground.

New equipment installed in 1962 was as follows:

- 1 hoist, double-drum (5-ft. diam. with 175-hp. motor, Wild of England).
- 1 exhaust fan (Buffalo No. 45, type MW, 11,000 cfm. with 40-hp. motor).
- 2 mill Pachuca tanks (wooden 14-ft. diam. 38 ft. high).
- 1 D.C. magnet (size 30 x 48 in., 125v., 2,500 watts, Dings Manufacturing Co.).
- 3 transformers (200-kva, 2,200/550-v., 1-phase, 25-cycle, Pyranol-filled, Canadian General Electric).
- 3 transformers (150-kva., 26,000-1,300-v. to 23,000/4,600-v., 1-phase, 25-cycle, Canadian Westinghouse).

The following is taken from the company annual report for the year ending 31 December 1962.

Ore Reserves

Ore reserves at the close of the year were estimated at 2,426,000 tons with an average grade of 5.13 pennyweight, as compared with 2,455,000 tons with an average grade of 5.15 pennyweight for 1961.

Ore	1962	1961
Unbroken ore.....	2,160,000	2,162,000
Broken ore.....	266,000	293,000
Total.....	2,426,000	2,455,000

Ankerite ore comprises 39 percent of the reserves. This ore is more refractory to the milling process than the normal ore in the mine.

Costs

The expenditure on development was \$1,186,617, or \$1.66 per ton as compared with \$939,669, or \$1.31 per ton milled in 1961.

The above figures for development in 1962 include \$233,415, or \$0.33 per ton expenditure on shaft sinking.

The expenditure on mining was \$3,588,872, or \$5.02 per ton as compared with \$3,412,673, or \$4.78 per ton milled in 1961.

The total operating charges for the year were \$6,023,146, or \$8.43 per ton as compared with \$5,644,958, or \$7.90 per ton milled in 1961.

Mining

The 714,500 tons of ore milled during the year were produced as follows:

Source of Ore	Mined	Average Grade
	tons	dwt. per ton
From stopes.....	626,500	5.14
From development.....	88,000	3.43
Total.....	714,500	4.93

The following tabulation is presented to indicate the sections of the mine from which the ore came:

Source of Ore	Mined	Average Grade
	tons	dwt. per ton
5th level to surface.....	7,753	2.46
Ankerite veins.....	173,226	4.07
Area serviced by No. 6 internal shaft.....	264,700	5.05
Remainder of mine.....	268,821	5.44
Total.....	714,500	4.93

Mill

Following are the milling results:

Ore treated.....	tons	714,500
Average per day worked.....	tons	1,985
Average grade of ore treated.....	dwt. per ton	4.93
Recovery.....	dwt. per ton	4.82
Recovery.....	percent	97.74

The average number of employees was 896: 622 underground, and 274 on surface. C. P. Girdwood was general manager.

Hallnor Mines Limited

Hallnor Mines Limited was incorporated in April 1936, with an authorized capitalization of 2,000,000 shares of \$1 par value, all of which have been issued. The directors and officers were: J. R. Bradfield, president and director; R. V. Porritt, vice-president and director; J. H. Stovel, general manager and director; F. M. Connell, W. S. Row, and L. H. Timmins, directors; C. H. Windeler, secretary; R. G. Rudolf, treasurer. The executive office is at 1700 Bank of Nova Scotia Building, Toronto 1. The mine address is Pamour.

The property comprises eight claims in Whitney township, Porcupine area, District of Cochrane, adjoining the west boundary of the Pamour Porcupine mine.

Mining and milling continued throughout 1962.

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SHAFTS, HALLNOR MINE

	Claim Number	Inclination	Number of Compartments	Collar Depth	Vertical Depth from Surface
Main shaft	N. ½ lot 7, con. V. Whitney twp.	Vertical	3	nil	3,477
2230 winze	————	45°	2	3,354	3,742
No. 3 shaft	————	Vertical	3	3,198	3,890

The vertical, three-compartment No. 3 internal shaft was collared on the 21st level at a depth of 3,198 feet, and sunk 692 feet in 1962 to a total depth of 3,890 feet below surface. The 25th level was established at a depth of 3,861 feet.

Development work in 1962 included: 953 feet of drifting; 1,033 feet of crosscutting; and 709 feet of raising. Total development footage to 31 December 1962 was as follows: 63,650 feet of drifts; 18,112 feet of crosscuts; 23,398 feet of raises. Diamond-drilling consisted of 175 holes, totalling 17,934 feet from underground. New equipment consisted of a tandem drum hoist (6 x 6 ft., Canadian Ingersoll-Rand) installed at No. 3 internal shaft.

The following is taken from the company annual report for the year ending 31 December 1962:

Stoping

Ore broken in stopes amounted to 122,000 tons, and the ore drawn off amounted to 124,500 tons. The broken-ore reserve was 6,250 tons at the year's end.

The tonnage hoisted from below the 17th level amounted to 70 percent of the total.

A tabulation of ore production by levels for the year 1962, and of totals since production commenced in June, 1936 is as follows:

Level	Below Surface	1962	1936 to 1962
	feet	tons	tons
1st to 18th	1,400	37,420	2,463,760
18th	2,750	1,290	24,740
19th	2,900	45,050	131,140
20th	3,050	26,080	94,810
21st	3,200	—	26,830
22nd	3,350	4,890	10,860
23rd	3,500	6,500	15,050
24th	3,720	3,245	4,685
Stoping Total		124,475	2,771,875
Development		3,090	198,240
Total		127,565	2,970,115

Backfill placed in stopes amounted to 62,320 tons.

Mill

The mill was in continuous operation throughout the year. The ball mill operated 97.5 percent of the possible running time, and averaged 352 tons per day as compared to 333 tons per day in 1961.

The mill treated 128,350 tons of ore, averaging 0.29 ounces gold per ton; and with a recovery of 97.77 percent, production amounted to 35,840 ounces of gold, and 2,154 ounces of silver.

To 31 December 1962, the mill has treated 2,969,200 tons of ore, from which were recovered 1,181,800 ounces of fine gold and 91,500 ounces of fine silver, having a combined value of \$42,888,800.

Ore Reserves

At 31 December 1962, ore reserves were estimated at 148,000 tons, grading 0.31 ounces of gold per ton as compared to 178,100 tons at 0.33 ounces per ton at the end of 1961. Of this, 46,800 tons at an average cut grade of 0.23 ounces per ton remained above the 8th level, compared to 64,900 tons grading 0.27 ounces per ton cut in 1961.

This reserve does not include any ore below the 23rd level.

The average number of employees was 206: 130 underground, and 76 on surface. J. M. Gordon was manager.

H. G. Young Mines Limited

H. G. Young Mines Limited was incorporated in January 1946; in 1962 the authorized capitalization was increased to 7,000,000 shares of \$1 par value of which 5,296,485 shares have been issued. The directors and officers were: H. G. Young, chairman of the board; W. H. Maedel, president, treasurer and director; J. D. Streit, vice-president and director; J. M. Godfrey, secretary and director; E. G. Bishop, and B. W. Lang, directors. The head office is at 1702, 80 Richmond Street West, Toronto 1. The mine address is Box 130, Balmertown.

The property, consisting of nineteen claims, is located in Balmer township, Red Lake area, District of Kenora (Patricia Portion). It adjoins part of the east boundary of Campbell Red Lake property, and includes part of the land under the water of Balmer Lake.

Mining and milling continued throughout 1962.

The mine is serviced by the vertical, three-compartment No. 1 shaft, 1,052 feet deep, located on claim K.R.L.20068.

Development footage in 1962 included: 1,695 feet of drifting; 158 feet of crosscutting; 614 feet of raising. Total development footage to 31 December 1962 was as follows: 9,078 feet of drifts; 5,822 feet of crosscuts; 4,150 feet of raises. Diamond-drilling in 1962 consisted of 40 holes, totalling 23,734 feet, from underground.

The following is taken from the company annual report for the year ending 31 December 1962.

Summary

A program of development and stoping was pursued throughout the year, and milling operations continued for the full twelve months at the average rate of 323 dry tons per day.

Stoping

	Tons
Broken.....	81,584
Hoisted.....	117,095
Broken-ore reserves.....	11,457

Milling

A total of 117,845 dry tons of ore was milled producing 21,867.922 ounces of gold and 2,357.354 ounces of silver, valued at \$821,317.11.

In addition it is estimated that \$224,692.90 will be received under the terms of the Emergency Gold Mining Assistance Act.

The ore delivered to the mill was derived from the following sources:

From stopes.....	tons	117,095
From development.....	tons	4,045
		<hr/>
Total to mill.....	tons	121,140
On hand at mill.....	tons	350
		<hr/>
Milled.....	wet tons	120,790

The average number of employees was 89: 53 underground, and 36 on surface. W. R. McDonald was mine manager.

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Hollinger Consolidated Gold Mines Limited

Hollinger Consolidated Gold Mines Limited was incorporated in January 1916. The authorized capitalization was 5,000,000 shares of \$5 par value, of which 4,920,000 shares have been issued. The directors and officers were: J. R. Timmins, chairman of the board and director; A. A. McMartin, president and director; N. A. Timmins, vice-president and director; P. C. Finlay, vice-president, treasurer, and director; Hon. Edouard Asselin, Duncan McMartin, J. A. McDougald, M. C. G. Meighen, and W. E. Phillips, directors; C. G. Cowan, secretary. The mine office and head office is at Timmins. The general office is at 44 King Street West, Toronto 1.

The Timmins property operated by the company, consists of twenty-six claims located in Tisdale township, Porcupine area, District of Cochrane, and includes part of the ground underlying the town of Timmins. The company has numerous holdings and interests. It owns and operates the Ross mine in Hislop township, District of Cochrane.

HOLLINGER MINE

Mining and milling operations continued throughout 1962.

SHAFTS, HOLLINGER MINE

Shaft	Claim Number	Inclination	Number of Compartments	Collar Depth	Vertical Depth from Surface
Main	P.13156	Vertical	3	feet	feet
Central	P.13157	Vertical	6	Surface	2,770
No. 26	P.13156	Vertical	5	Surface	3,063
No. 11	P.13144	Vertical	2	Surface	2,755
No. 19	Schumacher veteran lot	Vertical	3	Surface	3,954
No. 6	P.13218	Vertical	2 { 0-200 ft. filled 200-425 ft. travelway	Surface	425
No. 21	—	Vertical	2 { 1,550-2,750 ft. filled 2,750-3,950 ft. travelway	1,550	3,950
No. 25 ⁽¹⁾	—	Vertical	3	3,950	5,438
No. 27 ⁽²⁾	—	Vertical	4	2,750	5,293

⁽¹⁾No. 25 shaft—Hoist is on 3,800-foot level.

⁽²⁾No. 27 shaft—Hoist is on 2,450-foot level.

Note: All other shafts not in use have been stoped, filled, etc.
Inactive shafts from surface have been bulkheaded.

Development work during the year included: 6,041 feet of drifting; 3,204 feet of crosscutting; 26,819 feet of rock passes, development, and stope raising. Total development from 1931 to 31 December 1962 was as follows: 1,302,331 feet of drifts; 685,447 feet of crosscuts; 930,385 feet of raises. Diamond-drilling in 1962 consisted of 954 holes, totalling 99,102 feet, from underground and 2 holes, totalling 2,066 feet, from surface.

The following is taken from the company annual report for the year ending 31 December 1962.

The increase in the premium on U.S. funds during 1962 more than offset the effect of reduced millhead grade. The tonnage and value of the ore reserve were sharply lower than in 1961.

Comparative Production Statistics for 1960 and 1961

Production	1962	1961
Operated days	270	269
Milled tons	1,049,369	1,056,323
Millhead grade per ton ounces	0.265	0.277
Millhead value per ton	\$ 9.98	\$ 9.88
Average value of tailings per ton	\$ 0.30	\$ 0.27
Gold produced ounces	269,529	284,378
Average value received per ounce of gold	\$ 37.39	\$ 35.40
Bullion production	\$10,162,174	\$10,147,180
Operating cost (before taxes and depreciation)	\$10,254,831	\$10,305,557

Cost Summary

Cost Per Ton	1962	1961
Mining charges	\$6.51	\$6.41
Milling charges	0.82	0.81
General charges	1.04	1.17
Vacation pay, insurance, and other employee benefits	0.55	0.55
Administrative charges	0.86	0.82
Total Charges	\$9.78	\$9.76

The price received for gold ranged from \$36.57 to \$38.15 per ounce, and averaged \$37.39 for each ounce sold. The price at the year's end was \$37.67 per ounce, up \$1.17 per ounce from 1961.

Productivity, at 2.55 tons per man-shift, was up 0.02 tons from 1961. The over-all cost of producing a ton of ore remained nearly constant, only because the increases in cost of higher wage rates and in the cost of some supplies in 1962 were equal to the added cost of flood damage in 1961.

The ore reserve was depleted by 437,600 tons to 1,597,000 tons, having a grade estimated to average 0.282 ounces of gold per ton. The value per ton, with gold at \$35 per ounce, was \$9.87. This compares with a grade of 0.294 ounces of gold per ton having a value of \$10.29 at the end of 1961.

The increase in the rate of consumption of the ore reserve is the expected result of having fewer ore-producing possibilities to develop. Underground exploratory programs have been completed, and any development work now undertaken is for the purpose of facilitating the mining of known ore. In this connection, the ability to provide and maintain a sufficient number of work-places is of more critical importance than the opportunity to add relatively small amounts to the reserve.

The average number of employees was 1,596: 1,009 underground, and 587 on surface. E. A. Perry was manager.

ROSS MINE

The Ross property, consisting of 456 acres, is located in Hislop township, District of Cochrane. The mine address is Holtyre.

Mining and milling continued throughout 1962.

SHAFTS, ROSS MINE

	Location	Inclination	Number of Compartments	Depth from Surface
No. 1 shaft	N. ½, lot 1, con. II, Hislop twp.	Vertical	3	feet
No. 2 winze (below 300-foot level)		Vertical	2	2,646 1,526

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Development work in 1962 included 1,491 feet of drifting; 3,607 feet of cross-cutting; and 1,259 feet of raising. Total development footage to 31 December 1962 was as follows: 41,091 feet of drifts; 36,964 feet of crosscuts; 30,502 feet of raises. Diamond-drilling consisted of 200 holes, totalling 27,785 feet, from underground.

A former cookery and doctor's office were converted into residences.

New equipment added included: a mechanical loader (Eimco model 21); A Dorrclone separator (12-in.); two Krieg cyclone separators (6-in.).

The following is taken from the company annual report for the year ending 31 December 1962.

The intensified development of the lower levels added appreciably to mining costs. Lower value of mill feed has made the excess of operating costs over bullion receipts greater by nearly \$98,000 than in 1961.

The following table gives comparisons of production figures for 1961 and 1962:

Production	1962	1961
Operated days	344	347
Milled tons	139,506	145,291
Millhead grade per ton ounces	0.146	0.158
Millhead value per ton	\$ 5.78	\$ 5.86
Average value of tailings per ton	0.44	0.45
Gold produced ounces	18,724	21,080
Average value received per oz. of gold	\$ 37.45	\$ 35.47
Bullion production	\$745,363	\$784,909
Operating cost (before taxes and depreciation)	\$904,613	\$846,652

Cost Summary

Cost Per Ton	1962	1961
Mining charges	\$3.24	\$2.62
Milling charges	1.78	1.82
General charges	0.80	0.78
Vacation pay, insurance and other employee benefits	0.27	0.24
Administrative charges	0.40	0.37
Total Charges	\$6.49	\$5.83

The higher mining charge was attributable to the increase in tempo of development work. During the year, more than 5,000 feet of drifting and crosscutting was done and 28,000 feet of diamond-drilling was completed. The downward extensions of some oreshoots from above the 1,500-foot level have been traced to the 2,550-foot level, and one new ore section has been found. There was no evidence of change in either grade or character of the indicated ore, and work to date has generally substantiated results obtained from exploratory diamond-drilling.

The ore reserve at the end of 1962 was 473,600 tons averaging 0.184 ounces of gold per ton, and was equal to \$6.46 per ton with gold valued at \$35.00 per ounce. It includes 92,500 tons averaging 0.2064 ounces of gold per ton from the new levels below the 1,500-foot level. The reserve was 27,400 tons less than the figure for 1961 after producing 139,506 tons of mill feed, but the average grade was higher by 16 cents per ton.

The average number of employees was 106: 53 underground, and 53 on surface. J. J. Caty was resident manager.

Hugh-Pam Porcupine Mines Limited

Hugh-Pam Porcupine Mines Limited was incorporated in December 1935, with an authorized capitalization of 4,000,000 shares of \$1 par value, of which 3,999,399 shares have been issued. The directors and officers were: H. F. Brown-

bill, president and director; W. H. Maedel, vice-president, secretary-treasurer and director; F. G. Lawson, vice-president and director; D. G. Lawson and G. A. MacMillan, directors. The head office is at Room 1702, 80 Richmond Street West, Toronto. The mine address is Pamour.

The company owns fifteen claims in Whitney township, Porcupine area, District of Cochrane. The mine is operated under the management of Broulan Reef Mines Limited, and the ore is treated in the Broulan mill.

SHAFTS, HUGH-PAM MINE

	Claim Number	Inclination	Number of Compartments	Collar Depth	Vertical Depth from Surface
Mulholland shaft.....	12708	Vertical	2 (inactive)	feet 0	feet 200
Hughes shaft.....	13096	Vertical	2 (inactive)	0	200
No. 1 winze.....	—	70°	2 (inactive)	200	318
No. 2 winze.....	—	Vertical	2	2,500	2,628

The No. 2 winze, collared at 2,500 feet, was sunk 128 feet in 1962, to a total depth of 2,628 feet below surface. The 2,661-foot level was established at a vertical depth of 100 feet below No. 2-winze collar. All work on the Hugh-Pam property is done through extensions of the Reef workings of Broulan Reef mine; surface hoisting is through the Reef shaft.

Development footage in 1962 included: 1,018 feet of drifting; 38 feet of crosscutting and 404 feet of raising. Total development footage to 31 December 1962 was as follows: 18,173 feet of drifts; 1,864 feet of crosscuts; 6,585 feet of raises. Diamond-drilling in 1962 consisted of 74 holes totalling 11,189 feet, from underground.

The following is taken from the company annual report for the year ending 31 December 1962.

Production and Milling

During the year 37,944 tons of ore was mined and milled. Average recovery was 0.127 ounces of gold or \$4.74 per ton milled.

Ore Reserves

Proven ore reserves are calculated to be 36,000 tons having an average uncut grade of 0.47 ounces of gold per ton or a grade cut to one ounce of 0.18 ounces per ton.

Operating costs for the 37,944 tons mined and milled during the year, including head office administration and general expenses amounted to \$9.78 per ton.

The employment figures were included with the total of Broulan Reef Mines Limited in this report. H. V. Pyke was mine manager.

Kenilworth Mines Limited

Kenilworth Mines Limited was incorporated in January 1962 with an authorized capitalization of 5,000,000 shares of \$1 par value, of which 1,900,000 shares have been issued. The directors and officers were: H. L. Pountney, president and director; C. W. Miller, manager and director; V. E. Irons, treasurer and director; J. A. McConnell, secretary. The head office and mine address is Box 945, Timmins.

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The property, formerly known as the Naybob Gold Mine, consists of sixteen claims in Ogden and Deloro townships, District of Cochrane.

Operations proceeded from 14 May to 31 December 1962.

The vertical, three-compartment No. 1 shaft located in claim HR-938 and sunk to a depth of 1,347 feet below surface by former operators, was dewatered to the 200-foot level at year end. Some 11 diamond-drillholes totalling 4,956 feet were completed from surface.

The surface buildings, including the headframe, hoist and compressor plant buildings, were rehabilitated. New construction in 1962 included: a dry building (65 x 40 ft.); a crusherhouse (52 x 37 ft.); a shop building (26 x 20 ft.)—all of concrete block with wooden roof. A mine hoist (4-foot double-drum, with 150-hp. electric motor, Canadian Ingersoll-Rand) was installed.

C. W. Miller was manager, and 20 men were employed during the period of operation.

Kerr-Addison Gold Mines Limited

Kerr-Addison Gold Mines Limited was incorporated in April 1936, with an authorized capitalization of 5,000,000 shares of \$1 par value, of which 4,730,302 shares have been issued. The directors and officers were: W. S. Row, president and director; K. C. Gray, executive vice-president and director; M. S. Fotheringham, F. M. Connell, J. R. Bradfield, J. O. Hinds, H. H. Leather and W. D. Smith, directors; B. C. Bone, treasurer; R. D. Stewart, secretary; J. B. Sage, assistant secretary. The head office is at 44 King Street West, Toronto. The mine address is Virginiatown.

The company's main property consists of thirty-four claims in McGarry township, Larder Lake area, District of Timiskaming.

Mining and milling continued throughout 1962.

SHAFTS, KERR-ADDISON MINE

Shaft	Claim No.	Inclination	Number of Compartments	Total Depth from Surface
No. 3.....	H.J.B.30	Vertical	5	feet 3,995
No. 4 (collared on 3,850-foot level)....		Vertical	3	6,022

Development work in 1962 included: 6,211 feet of drifting; 2,014 feet of crosscutting; and 4,764 feet of raising. Total development footage to 31 December 1962 was as follows: 215,460 feet of drifts; 84,266 feet of crosscuts; 158,740 feet of raises. The total footage includes some development work on Chesterville and Arjon properties. Diamond-drilling in 1962 consisted of 138 holes totalling 28,874 feet from underground, and three holes totalling 4,878 feet from surface.

Equipment added in 1962 included the following:

- 1 sheave (14-foot diameter, complete with shaft and bearings for No. 3 headframe, United Steel Corp.).
- 20 timber trucks (for No. 4 shaft workings, Wabi Iron Works).
- 2 trucks (½-ton pickup for surface yard, General Motors).

The following is taken from the manager's report for the year ending 31 December 1962.

Ore Reserves

Proven ore reserves, including allowances for dilution, were as follows at the year's end:

Level	Tons	Ounces Per Ton
Surface to 1,600-foot level.....	509,409	0.2758
1,600-foot to 2,500-foot level.....	1,964,520	0.3126
2,500-foot to 3,700-foot level.....	1,766,184	0.3981
3,700-foot to 4,550-foot horizon.....	2,577,030	0.5226
Total Reserve at the End of 1962.....	6,817,143	0.4114
Total Reserve at the End of 1961.....	7,761,093	0.4153

The total reserve at the end of 1962 includes 28,293 tons of broken ore having an average grade of 0.2680 ounces per ton. The decrease in ore during 1962 amounted to 943,950 tons, although 1,242,933 tons were milled. The gain of 298,983 tons is accounted for by some dilution, additional ore obtained by slashing in stopes, and through revisions to ore estimates.

Summary of Operating Results

Production	1962	1961
Milled..... tons	1,242,933	1,490,319
Average milled per day..... tons	3,405.3	4,083.1
Total gold recovered..... oz.	418,150.29	520,867.17
Total silver recovered..... oz.	25,394.05	29,309.07
Average mill-head value (bullion plus tails)..... oz. per ton	0.3439	0.3563
Average mill-head value (gold at \$35 per oz.)..... per ton	12.038	12.471
Recovery..... percent	97.8	98.1
Total realized value of bullion (Canadian funds).....	\$15,742,590.26	\$18,615,841.51
Total realized value of bullion per ounce of gold.....	\$37.65	\$35.74
Total realized value of bullion per ton milled.....	\$12.666	\$12.491

Cost of Production

	1962		1961	
	In Full	Per Ton	In Full	Per Ton
Development.....	\$ 435,463.64	\$0.351	\$ 757,404.88	\$0.508
Stope development.....	236,584.64	0.191	279,172.57	0.187
Mining.....	3,414,604.14	2.747	3,791,208.25	2.544
Haulage.....	482,666.76	0.388	540,612.66	0.363
Hoisting.....	360,079.03	0.290	418,492.11	0.281
General mine charges.....	2,144,483.59	1.725	2,354,372.17	1.580
Crushing and conveying.....	219,032.15	0.176	244,124.93	0.164
Milling.....	1,275,348.42	1.026	1,417,585.92	0.951
General expense.....	689,857.12	0.555	694,134.22	0.466
Bullion marketing.....	110,587.57	0.089	115,211.40	0.077
Total Operating Cost at Mine..	\$9,368,707.06	\$7.538	\$10,612,319.11	\$7.121

Total plant cost of production was down nearly \$1¼ million due to the decrease in tonnage milled, although the cost per ton increased by 42 cents.

Development costs were down as a result of an appreciable decrease in drifting and crosscutting. Stopping costs were up, due principally to an increase in the tonnage mined by square-set mining methods.

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The distribution of ore production from the mine is shown in the following table:

Source of Ore	1962		1961	
	Tons	Percent	Tons	Percent
Surface to 1,900-foot level	275,496	22.2	352,282	23.7
1,900-foot to 2,500-foot level	287,231	23.1	377,487	25.4
2,500-foot to 3,100-foot level	260,856	21.0	252,382	16.9
3,100-foot to 3,700-foot level	250,298	20.2	389,450	26.2
Below 3,700-foot level	168,229	13.5	116,746	7.8
Total Ore Produced	1,242,110	100.0	1,488,347	100.0

In the following table the tonnages of ore broken by the different mining methods employed are summarized. It will be noted that tonnage of ore mined by square-set mining methods has now increased to 33.4 percent as compared with 26.1 percent in 1961.

Mining Method	1962		1961	
	tons	percent	tons	percent
Cut-and-fill stoping	711,487	60.4	930,119	66.1
Cut-and-fill pillar recovery	27,784	2.4	40,661	2.9
Total Cut-and-fill Mining	739,271	62.8	970,780	69.0
Square-set stoping	272,691	23.2	213,695	15.2
Square-set pillar recovery	119,966	10.2	153,869	10.9
Total Square-set Mining	392,657	33.4	367,564	26.1
Total Cut-and-fill and Square-set Mining	1,131,928	96.2	1,338,344	95.1
Shrinkage stoping	15,841	1.3	20,804	1.5
Total Mining	1,147,769	97.5	1,359,148	96.6
Development ore	29,404	2.5	47,330	3.4
Total Ore Broken	1,177,173	100.0	1,406,478	100.0
Percentage of tons milled	—	94.7	—	94.4

Hydraulic fill produced from mill tailings amounted to 536,162 cubic yards, which accounted for 90 percent of all backfill placed.

The average number of employees was 1,300: 890 underground, and 410 on surface. R. J. Beggs was manager.

Lake Beaverhouse Mines Limited

Beaverhouse Lake Gold Mines Limited was incorporated in June 1935; in July 1950, the name was changed to Lake Beaverhouse Mines Limited on a two for five share basis, the authorized capitalization is 5,000,000 shares of \$1 par value, of which 3,250,000 shares have been issued. The directors and officers were: A. W. Johnston, president and director; A. E. Rosen, vice-president and director; William McKee, W. C. Campbell, Van Hoose Smith, D. C. Webster, and L. I. Ross, directors; H. B. Hicks, general manager; W. M. O'Shaughnessy, secretary-treasurer. The head office is at 100 Adelaide Street West, Toronto 1. The mine address was Dobie.

The property consists of thirty-two claims located in Gauthier and McVittie townships, Kirkland-Larder Lake area, District of Timiskaming. It was formerly

known as Argonaut Gold Mines Limited and had produced \$799,759 in gold when production ceased in 1935. On 5 April 1939, Beaverhouse Lake Gold Mines Limited reopened the mine and did some drifting and crosscutting on the 500-foot level, suspending operations on 10 October 1939. The mine is serviced by the vertical two-compartment No. 3 shaft, 520 feet deep, located on claim 2587. There is also a vertical, two-compartment winze from the 500-foot level to a total depth of 1,270 feet below surface.

Operations by Lake Beaverhouse Mines Limited proceeded from 15 August to 21 December 1962. All work was under the management of Augustus Explorations Limited. N. Morissette did the diamond-drilling on the 200- and 350-foot levels and R. F. Fry and Associates did the drifting on the 80- and 200-foot levels. A temporary surface plant was constructed, consisting of the following: a hoist-room, a headframe and a combined dry including workshop and compressor room, office and staff accommodation. The No. 3 shaft was pumped below the 375-foot level.

The following table shows the development work at 31 December 1939, during 1962, and the total at 31 December 1962:

Level	Total 31 Dec. 1939	1962	Total 31 Dec. 1962
	feet	feet	feet
80-Foot drifts.....	0	356	356
200-Foot drifts.....	2,332	251	2,583
crosscuts.....	968	0	968
No. 351 (sublevel) drifts.....	246	0	246
350-Foot drifts.....	3,615	0	3,615
crosscuts.....	1,774	0	1,774
No. 507 (sublevel) drifts.....	162	0	162
crosscuts.....	102	0	102
500-Foot drifts.....	3,516	0	3,516
crosscuts.....	1,595	0	1,595
625-Foot drifts.....	1,111	0	1,111
crosscuts.....	1,402	0	1,402
875-Foot drifts.....	1,268	0	1,268
crosscuts.....	1,690	0	1,690
1,000-Foot drifts.....	1,510	0	1,510
crosscuts.....	1,289	0	1,289
1,125-Foot drifts.....	780	0	780
crosscuts.....	1,262	0	1,262
1,250-Foot drifts.....	278	0	278
crosscuts.....	2,035	0	2,035

Some 64 diamond-drillholes totalling 14,815 feet were completed from underground. A total of 1,470 tons of ore was hoisted.

T. D. Anderson, project engineer, was in charge, and 20 men were employed during the period of operation.

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Lake Shore Mines Limited

Lake Shore Mines Limited was incorporated in February 1914, with an authorized capitalization of 2,000,000 shares of \$1 par value, all of which have been issued. The directors and officers were: R. C. Stanley, Jr., president and director; J. G. Boeckh, executive vice-president, treasurer and director; J. C. Adamson, P. K. Hanley, J. C. L. Allen and S. J. Bird, directors; Miss B. A. Argo, secretary; H. W. Wright, comptroller. The head office and mine office is at Kirkland Lake. The executive office is at 199 Bay Street, Toronto.

The company's main property consisting of about 287 acres, is in Teck township, Kirkland Lake area, District of Timiskaming.

Mining and milling continued throughout 1962.

SHAFTS, LAKE SHORE MINE

	Claim Number	Inclination	Number of Compartments	Collar Depth	Vertical Depth from Surface
				feet	feet
No. 1 shaft.....	L.1557	Vertical	3 (inactive)	—	2,250
No. 2 shaft.....	L.2243	19°	1	—	200
No. 3 shaft.....	L.2506	Vertical	5	—	3,995
No. 5 shaft.....	L.2506	Vertical	5	—	3,995
No. 1 shaft extension.....	—	Vertical	3 (inactive)	2,000	4,507
No. 4 shaft.....	—	Vertical	3	4,325	8,176
No. 6 shaft.....	—	Vertical	5	3,575	6,124

Development work during the year included: 1,500 feet of drifting; 533 feet of crosscutting; and 983 feet of raising. Total development footage to 31 December 1962 was as follows: 278,865 feet of drifts; 107,809 feet of crosscuts; 153,869 feet of raises. Diamond-drilling in 1962 consisted of 90 holes, totalling 8,464 feet from underground.

The following is taken from the company annual report for the year ending 31 December 1962.

Production

	1962	1961
Ore milled..... tons	141,075	169,785
Average milled per day..... tons	387	465
Gold produced..... oz.	51,625.421	57,804.937
Silver produced..... oz.	27,494.932	22,626.740
Average gold recovery per ton..... oz.	0.3659	0.3405
Price per ounce for gold.....	\$ 37.49	\$ 35.54
Gross value of production estimated.....	\$2,463,255	\$2,576,115
Average value per ton.....	\$ 17.46	\$ 15.17
Total operating expense.....	\$2,313,293	\$2,450,632
Operating expense per ton milled.....	\$ 16.40	\$ 14.43
Operating cost per ounce of gold recovered.....	\$ 44.81	\$ 42.39
Total Operating Profit.....	\$ 149,962	\$ 125,483
Operating profit per ton milled.....	\$ 1.06	\$ 0.74

At \$17.46 the average revenue per ton of ore treated in 1962 was \$2.29 higher than in 1961. A higher recovery of both gold and silver per ton of ore milled and the better price received for gold from the Mint, as a consequence of the devaluation of the Canadian dollar, account for the

higher value per ton. Largely because of these two factors the operating profit for the year was up moderately from the preceding period, although there was a reduction in the tonnage milled.

From the start of milling operations in March 1918, to 31 December 1962, the mine has produced and the mill has treated 16,295,361 tons of ore from which was recovered bullion having a gross value of \$264,973,939.

Operating Costs

Operating costs per ton of ore milled for the last two years are tabulated below:

	Cost per Ton Milled	
	1962	1961
Mine development.....	\$ 1.058	\$ 1.359
Mining.....	8.910	7.562
Milling.....	2.379	2.222
Marketing expense.....	0.111	0.095
General expense at the property.....	2.506	1.954
Mine office and supervision.....	1.006	0.880
Provincial mining tax.....	0.040	0.002
Administrative and corporate expense.....	0.388	0.360
Total Operating Cost.....	\$16.398	\$14.434

Milling

During the year the mill treated 141,075 tons of Lake Shore ore for an average daily milling rate of 387 tons, compared with 169,785 total tons and 465 tons per day in 1961. Recovery was 97.35 percent of contained gold in 1962 as against 97.12 percent in 1961. The improved percentage recovery was largely due to the higher average grade of the ore treated during the year.

The mill also treated 149,384 tons of ore from the Wright-Hargreaves mine equivalent to 409 tons per day for the period. Additionally, 138,332 tons of cyanide tailings from the mill of Macassa Gold Mines Limited, was processed in the tailings retreatment plant.

Mining

Ore production was from twenty-one of the fifty-eight main levels in the mine down to the 8,075-foot horizon. A tabulation based on the stages of hoisting required to raise the ore to surface follows:

	Tons from Development	Tons from Stopping	Total Tons	Percent of Total	Hoisting Stages
Surface to 3,950-foot level.....	—	19,060	19,060	13.5	1
4,075-foot level to 6,075-foot level.....	1,237	32,521	33,758	23.9	2
Below 6,075-foot level.....	8,345	79,912	88,257	62.6	3
Total.....	9,582	131,493	141,075	100.0	—

Of the total ore produced, 6.8 percent came from development work compared with 12.4 percent in 1961.

In the year the occurrence of ground movements caused a serious reduction in the output from orebodies that were being mined on some of the levels above the 6,075-foot horizon. In order to maintain the over-all output at the highest rate possible, accelerated mining schedules were established on the newly-developed lower level orebodies. Ore production from the five bottom levels in the mine was increased from the 1961 figure of 37.7 to 62.6 percent of the total ore produced, but the milling rate could not be maintained at the 1961 level.

The re-establishment of stopping sections, on some of the orebodies that have been seriously affected by ground movements, is so slow and costly that the mining of substantial tonnages, formerly classed as ore, is no longer profitable.

Ore Reserves

With conditions prevailing at the end of 1962, the ore reserve totalled 483,050 tons having an average gold content of 0.389 ounces per ton across 7.6 feet. This figure represents the tonnage of ore that can be mined provided the orebodies remain unaffected by further disturbances.

The average number of employees was 414: 242 underground, and 172 on surface. W. T. Robson was general manager.

Annual Report for 1962

Leitch Gold Mines Limited

Leitch Gold Mines Limited was incorporated in July 1935, with an authorized capitalization of 3,000,000 shares of \$1 par value, of which 2,912,505 shares have been issued. The directors and officers were: K. J. Springer, president and director; J. H. C. McClelland, vice-president and director; F. E. Hall, secretary-treasurer and director; S. H. Robinson and J. R. Cryderman, directors; G. A. McKay, director and mine manager. The head office is at 12 Richmond Street East, Toronto 1. The mine address is Beardmore.

The property, comprising fifty-one claims, is located in Eva and Summers townships, District of Thunder Bay, about 5 miles from Beardmore by motor road.

Mining and milling continued throughout 1962.

SHAFTS, LEITCH MINE

	Claim No.	Inclination	Number of Compartments	Total Depth from Surface
No. 1 shaft	H.F.I.	Vertical	3	feet 3,006
No. 2 winze (below 2,875-foot level)	—	Vertical	3	4,612

Development work during the year consisted of: 930 feet of drifting; 383 feet of crosscutting; and 952 feet of raising. Total development footage to 31 December 1962 was as follows: 62,145 feet of drifts; 24,139 feet of crosscuts; 29,287 feet of raises. Diamond-drilling in 1962 consisted of 22 holes, totalling 8,673 feet, from underground.

The following is taken from the company annual report for the year ending 31 December 1962:

Costs

The following table shows the operating costs for the year 1962:

	Per Ton Milled
Exploration and development	
Surface exploration	\$0.03
Crosscutting	0.43
Drifting	1.07
Raising	0.72
Underground diamond-drilling	0.64
	<hr/>
	\$2.89
Mining	17.60
Milling	5.82
	<hr/>
Total Operating Cost at the Mine	\$26.31

The total operating cost was slightly lower than the previous year's figure of \$26.63 per ton milled, due mainly to the reduced amount of development done. Mining costs were considerably higher, being \$17.60 per ton milled compared to \$15.77, while milling costs remained practically the same, \$5.82 compared to \$5.78.

The trends of unit costs in recent years are shown in the following schedule:

	1959	1960	1961	1962
Crosscutting and Drifting				
Cost per foot advance	\$33.15	\$40.14	\$41.09	\$37.75
Raising, cost per foot advance	20.93	25.15	32.82	25.34
Mining, cost per ton broken	11.96	14.65	14.93	14.37
Milling, cost per ton milled	5.23	5.86	5.78	5.82

All unit costs were equal to or better than those of the previous year. Ground conditions at depth continued to be the main problem in underground mining and development operations. Labour costs were increased by the two cents per hour increase that became effective 1 April.

Ore Reserves

Ore reserves to the 30th level are estimated at 68,846 tons grading 1.066 ounces per ton, or a total of 72,726.90 ounces.

Hoisting

Some 40,756 tons of ore was hoisted: 1,398 tons or 3.4 percent from drifts; 1,191 tons or 2.9 percent from raises; 38,167 tons or 93.7 percent from stopes.

Some 6,283 tons of waste was hoisted.

Milling

Some 33,757 tons of ore was milled after sorting 9,212 tons of waste. The average milling rate was 94.0 tons per day based on 359 days' operation during the year. Production for the year was 47,961.637 ounces of fine gold and 1,991.79 ounces of fine silver. Total value of production, including premium on free market sales and premium on Canadian dollar exchange, was \$1,807,169.64.

Average recovery was 1.422 ounces of gold per ton milled.

Tailings losses averaged 0.030 ounces per ton milled. Extraction was 97.9 percent.

General

Ore reserves are estimated to be good for about a year and a half at the present rate of production. Some submarginal material on the 30th level west of the main oreshoots may prove mineable when tested on the 28th and 29th levels. It can, however, only extend the life of the mine a few months at most. Extensive drifting of the No. 2 vein will be continued in the search for other oreshoots. Diamond-drilling and exploration will continue.

The average number of employees was 123: 59 underground, and 64 on surface. G. A. McKay was manager.

Lindsay Explorations Limited

Lindsay Explorations Limited was incorporated in February 1955, with an authorized capitalization of 5,000,000 shares of \$1 par value, of which 4,720,000 shares have been issued. The directors and officers were: M. H. Greenberg, president and director; T. A. Jones, vice-president and director; M. J. Plesha, secretary-treasurer and director; Reino Jalonen, Roy Barker, R. B. Krize, and S. W. Erickson, directors; I. A. MacNaughtan, assistant secretary-treasurer. The head office is at Room 309, 4 Richmond Street East, Toronto 1. The mine address is Sapawe.

The property comprises fifty-three claims in McCaul and Hutchinson townships, District of Rainy River, about 4.5 miles north of Sapawe, and is connected to the Atikokan highway by road.

Operations continued from 1 August to 15 December 1962.

The vertical, three-compartment No. 1 shaft, collared in claim F.F.3417, has a total depth of 351 feet below the collar. The first and second levels were established in 1961, at vertical depths of 172 and 322 feet, respectively, below the collar. Development footage in 1962 comprised: 695 feet of drifting, 7 feet of crosscutting, and 236 feet of raising. Total development footage to 31 December 1962 included: 826 feet of drifts; 367 feet of crosscuts; 236 feet of raises. A total of 10 diamond-drillholes, totalling 4,862 feet, were completed from surface, and four holes, totalling 412 feet, were completed from underground. A small amount of surface trenching, about 30 feet in length and averaging 2 feet in depth, was completed.

New construction consisted of an assay office (40- x 12-ft.). Added equipment included a jaw-crusher and motor.

A total of 1,816 tons of ore and 1,172 tons of waste was hoisted.

Grant and Oja Limited were in charge, and 10 men were employed during the period of operation.

Annual Report for 1962

Macassa Gold Mines Limited

Macassa Mines Limited was incorporated in April 1926, and Bicroft Uranium Mines Limited was incorporated in April 1955. In November 1961, the two companies were amalgamated under the name of Macassa Gold Mines Limited with an authorized capitalization of 4,000,000 shares of \$1 par value, of which 3,089,163 shares have been issued. The directors and officers were: R. A. Bryce, president and director; J. D. Bryce, executive vice-president and director; J. G. Boeckh, vice-president and director; J. C. L. Allen, T. D. Carlson, C. C. Huston, and R. C. Stanley Jr., directors; Larmour Soliague, assistant to the president; G. D. Pattison, secretary-treasurer; H. W. Salthouse, assistant secretary-treasurer. The head office is at 85 Richmond Street West, Toronto 1; the executive office is at 25 Adelaide Street West, Toronto 1. The mine address of the Macassa Division is Box 550, Kirkland Lake. The Bicroft Division is reported on in the Uranium section of this report under Macassa Gold Mines Limited, Bicroft Division.

MACASSA DIVISION

The Macassa Division property comprises eleven claims in Teck township, Kirkland Lake area, District of Timiskaming.

Mining and milling operations continued throughout 1962.

SHAFTS, MACASSA DIVISION

	Claim No.	Inclination	Number of Compartments	Depth from Surface
Elliot shaft (unused).....	L.1617	Vertical	2	feet 523
No. 1 or main shaft.....	L.2837	Vertical	3	3,043
No. 1 winze (below 3,000-foot level)....	—	Vertical	3	4,824
No. 2 shaft.....	L.4186	Vertical	3	4,633
No. 2 winze (below 4,625-foot level)....	—	Vertical	3	6,353

No. 2 winze was sunk 80.5 feet in 1962 to a total depth of 6,353 feet below surface; the 5,725-, 5,875-, 6,025-, 6,150-, and 6,300-foot levels were established. Development work during the year comprised: 3,083 feet of drifting; 2,304 feet of crosscutting; and 1,358 feet of raising. Total development footage to 31 December 1962 was as follows: 145,175 feet of drifts; 48,000 feet of crosscuts; 30,855 feet of raises. Diamond-drilling in 1962 consisted of 63 holes, totalling 8,409 feet, from underground.

New construction in 1962 consisted of a building, 20 by 14 feet, of concrete and tile, at No. 2 shaft to house a heater to supply heat to the shaft.

New equipment installed underground included the following:

- 2 stope drills (Sudbury Mining and Equipment Co.).
- 2 air slushers (Gardner-Denver Co.).
- 1 fan (axial-flow, Canadian Blower and Forge Co. Ltd.).

The following is taken from the company annual report for the year ending 31 December 1962.

Stoping

Greater use of timber and backfill to control ground has been required as stoping is advanced. Proportion of total ore break from filled stopes has increased from 14.5 to 42 percent, from timbered stopes from 17 to 31 percent, in the last five years. The break from shrinkage stopes has decreased from 59 to 21 percent in the same period.

It is anticipated that during 1963 a further 15 percent decrease in shrinkage stoping with a corresponding increase in filled stopes will be experienced.

To clarify this situation, a brief description of stoping is included.

Stoping is being kept to a planned sequence, which results in a limited tonnage from each vein being mined with maximum extraction of ore.

The reasons for this are: safety of the mining crews, and the prevention of rockbursts, or lessening their effect by decreasing frequency and severity.

From the production point of view, there are disadvantages as output per level and per vein is decreased. Grade can be effected adversely since no pillars are left, and lean sections must be mined; further, development costs will increase since it must be maintained well in advance of stoping.

On low dip veins, longwalling with timber support is practised. With increasing depth and contiguous openings, greater amounts of timber have been necessary.

The methods result in less storage of broken ore, and a supply of backfill is a necessity, while for a given break more men are necessary.

From long-term point of view the advantages to the life of the operation are apparent.

Mine Ventilation

A new, centrally located, axial-flow fan was installed on the 4,625-foot level. This doubled the amount of fresh air being delivered to the lower workings. The design is such that anticipated future requirements for air will be met. With the increased air supply additional heating facilities for air downcasting at No. 2 shaft were required.

Ore Reserves

From calculations based on samples from diamond-drilling, drifts, raises, and the extension of known veins by stoping operations, the ore reserves as at 31 December 1962 are:

Ore	Reserves	Average Grade	Value (Gold at \$35 per ounce)
	tons	oz. per ton	
Unbroken	728,900	0.4404	\$15.41
Broken	38,791	0.3883	\$13.59
Total and Average	767,691	0.4377	\$15.32

Note: Dilution factor 10 percent applied to grade only.

Unbroken-ore reserves are down 66,800 tons and broken-ore reserves are down 3,079 tons. Total reserves are down 69,879 tons. Average grade of reserves at \$15.32 compares with \$15.34 for 1961. This drop in reserves is due to the fact that most of our development work was done on opening new levels, and thus little work was done in the actual ore zone.

Costs

	1962		1961	
	per ton	per ounce	per ton	per ounce
Development and exploration	\$ 1.690	\$ 3.885	\$ 1.743	\$ 3.905
Mining	8.492	19.526	7.432	16.648
Milling	2.272	5.224	1.990	4.459
Undistributed charges	0.489	1.124	0.462	1.034
Administration and head office	—	—	(1)0.511	(1)1.144
Total	\$12.943	\$29.759	\$12.138	\$27.190
Depreciation	0.118	0.272	(2)0.213	(2)0.476
Provision for taxes	—	—	(3)0.603	(3)1.352
Total	\$13.061	\$30.031	\$12.954	\$29.018

(1)To 31 October 1961.

(2)Head office not included in depreciation.

(3)Municipal tax only, included for November and December 1961.

Note: Provision for taxes and head office administration not included above for 1962.

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Milling

During the year, 139,618 tons of ore was milled, giving a calendar-day average of 382.5 tons. The total recovery was 93.95 percent. These figures for 1961 were 419.6 and 93.68 percent. Tonnage drop was due to difficulty experienced by the mine in supplying ore.

Bullion recovered comprised 60,723.30 ounces of gold and 8,939.36 ounces of silver.

From October 1933, the start of milling operations at the Macassa mine, a total of 1,467,858.09 ounces of gold and 235,221.58 ounces of silver have been recovered from 3,534,024 tons of ore. The recovered value from this ore amounts to \$52,790,611.91 excluding cost-aid, and is equivalent to \$14.94 per ton.

The average number of employees was 317: 219 underground, and 98 on surface. M. R. MacPherson was mine manager.

McIntyre Porcupine Mines Limited

McIntyre Porcupine Mines Limited was incorporated in March 1911. In December 1959, the authorized capitalization was increased to 3,000,000 shares without par value, of which 2,377,737 shares have been issued. The directors and officers were: J. D. Barrington, president and managing director; W. B. Dix, vice-president, treasurer, and director; J. S. D. Tory, chairman of the board and director; M. A. Cooper, J. C. Fraser, Norman D'Arcy and S. M. Wedd, directors; M. L. Urquhart, vice-president of operations; F. T. McKinney, secretary. The address of the head office and the mine office is Schumacher. The executive office is at Suite 1500, 25 King Street West, Toronto.

The company has numerous holdings in Ontario: the chief of these is the McIntyre mine, comprising 3,542 acres in Tisdale township, Porcupine area, District of Cochrane. In 1960, Castle-Trethewey Mines Limited was purchased by McIntyre and became the Castle Division of McIntyre, reported on in the silver operations of this report.

Mining and milling at the McIntyre mine continued throughout 1962.

SHAFTS, MCINTYRE MINE

Shaft	Claim Number	Inclination	Number of Compartments	Collar Depth	Vertical Depth from Surface
No. 1.....	P.13307	Vertical	3 (inactive)	feet Surface	feet 307
No. 2.....	P.13307	Vertical	2 (inactive)	Surface	183
No. 3.....	P.13307	Vertical	2 (inactive)	Surface	183
No. 4.....	P.13307	Vertical	2 (inactive)	Surface	998
No. 5.....	P.13307	Vertical	2 to 1,375 ft. 4 below 1,375 ft.	Surface	2,389
No. 6.....	P.13710	Vertical	3 to 1,000 ft. 4 below 1,000 ft.	Surface	3,015
No. 7.....	P.13318	Vertical	2 (inactive) 3	Surface	989
No. 8.....	P.13318	Vertical	2 (inactive)	Surface	288
No. 9.....	P.13068	Vertical	2 (inactive)	Surface	204
No. 10.....	P.13068	Vertical	2 (inactive)	Surface	185
No. 11 or Main.....	P.13318	Vertical	5	Surface	4,131
No. 12.....	—	Vertical	4	3,875	7,111
No. 14.....	—	Vertical	4	3,750	7,336
No. 15 ⁽¹⁾	—	Vertical	4	6,825	8,094
No. 16.....	—	Vertical	4	5,500	6,848

⁽¹⁾Hoist is on 6,575-foot level.

Development work during the year comprised: 12,050 feet of drifting; 6,189 feet of crosscutting; and 169 feet of raising. Total development footage (for gold) to 31 December 1962 was as follows: 651,820 feet of drifts; 295,356 feet of crosscuts; 59,955 feet of raises. Development for copper ore in 1962 included: 7,572 feet of drifts and crosscuts; 7,828 feet of raises. Total development for copper ore to 31 December 1962 was 17,785 feet of drifts and crosscuts; 8,084 feet of raises. Diamond-drilling in 1962 included: 1,278 holes, totalling 182,476 feet, from underground and one hole, totalling 996 feet, from surface.

New equipment added included the following:

- 1 portable debarker (Cambio SV 17962).
- 1 jaw-crusher (Baxter RB 3630).
- 1 locomotive (two-motor, 11-ton, Goodman).
- 1 cage double-deck, aluminum and steel.
- 18 ore cars (40-cu. ft., Granby type).
- 8 ore cars (96-cu. ft., Granby type).
- 7 ore cars (bottom dump, Gable type).

A total of 717,812 tons of gold ore and 9,500 tons of copper ore was hoisted and milled. The average milled per day was 2,087 tons of gold ore, and 28 tons of copper ore for mill-testing purposes.

The following is taken from the company annual report for the year ending 31 December 1962:

Gold Development

Development work amounted to 18,384 feet and included 12,026 feet of drifting, of which 2,128 feet, or 18 percent was in ore averaging 0.3 ounces per ton over a width of 9 feet.

Lateral development was directed mainly to the extension of No. 22 vein zone, which accounted for 72 percent of the ore put in sight. Work from No. 15 internal shaft, below the 6,825-foot level, totalled 5,783 feet, of which 733 feet on the 6,975- and 7,125-foot levels were in ore averaging 0.294 ounces per ton over a width of 9.1 feet. The 7,425- and 7,875-foot levels were extended eastward towards the downward plunge projection of this vein, and at the year's end the 7,875-foot level was 1,350 feet east of the shaft and in the former Central Porcupine claims.

Nineteen deep diamond-drillholes, totalling 19,368 feet, were drilled throughout the mine. Of this footage, 8,015 feet were drilled around the east end of the Pearl Lake porphyry from the 500- to the 1,875-foot levels. The remaining footage was done from No. 16 and No. 22 vein workings between the 4,175- and 7,875-foot levels. Although some interesting intersections were obtained, the drilling program to date has not developed any new ore.

Copper Development

Definition drilling on the copper ore zone has now been completed between the 1,625- and 3,125-foot levels.

Development work amounted to 15,400 feet, which consisted of 7,572 feet of lateral work and 7,828 feet of raising. Included in these figures is stope development amounting to 4,623 feet of lateral work and 2,926 feet of raising. Four stopes are being prepared for a production rate of 1,000 tons a day beginning in August 1963.

The main ore-pass system from the 3,375-foot level to the 1,875-foot level, and the transfer, crushing, and loading facilities were completed late in the year. In November and December, 9,500 tons of development ore were put through the mill with satisfactory recoveries.

Pre-production development expenditures for the year amounted to \$729,934, and an additional \$626,240 was spent on alterations to the mill and other installations and additions. Total expenditures to date for the copper project amounted to \$2,047,944.

Production and Costs

	1962		1961	
	Total	Per Ounce Gold	Total	Per Ounce Gold
Gold and silver produced	\$8,422,377	\$37.60	\$7,865,329	\$35.64
Emergency gold mining assistance received	1,064,706	4.75	1,409,494	6.39
Total	\$9,487,083	\$42.35	\$9,274,823	\$42.03

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Operating Costs

	1962		1961	
	Total	Per Ounce Gold	Total	Per Ounce Gold
Mine development and exploration	\$1,072,382	\$ 4.79	\$1,090,272	\$ 4.94
Breaking and stoping	5,585,497	24.94	5,441,094	24.66
Milling	961,763	4.29	963,162	4.37
Marketing expense	59,008	0.26	58,988	0.27
Municipal and provincial taxes and lease rentals	37,261	0.17	37,005	0.17
Expenditures on internal shaft	Nil	Nil	323,813	1.46
Depreciation	189,087	0.84	225,589	1.02
Total	\$7,904,998	\$35.29	\$8,139,923	\$36.89
Operating income	\$1,582,085	\$ 7.06	\$1,134,900	\$ 5.14

Ore Reserves

	1962		1961	
	tons	oz. per ton	tons	oz. per ton
Estimated in place	1,555,680	487,555	1,700,115	540,212
Broken ore	55,120	12,646	51,629	12,901
Total	1,610,800	500,201	1,751,744	553,113
Average grade per ton	—	0.311	—	0.316

The average number of employees was 1,216: 810 underground, and 406 on surface. P. B. McCrodan was mine manager.

McKenzie Red Lake Gold Mines Limited

McKenzie Red Lake Gold Mines Limited was incorporated in February 1933, with an authorized capitalization of 3,000,000 shares of \$1 par value; in 1956 the capitalization was increased to 5,000,000 shares; in 1962 to 7,500,000 shares of \$1 par value, of which 5,400,000 shares have been issued. The directors and officers were: J. C. L. Allen, president and director; J. G. Boeckh, vice-president and director; P. K. Hanley and R. C. Stanley, Jr., directors; Miss B. A. Argo, secretary-treasurer. The head office is at Suite 602, 199 Bay Street, Toronto 1. The mine address is McKenzie Island.

The property consists of twelve claims at the north end of McKenzie Island in Red Lake, Dome township, District of Kenora (Patricia Portion).

Mining and milling operations continued throughout 1962.

SHAFTS, MCKENZIE RED LAKE MINE

	Claim Number	Inclination	Number of Compartments	Collar Depth	Vertical Depth from Surface
No. 1 shaft	K.R.L.87	Vertical	3 (inactive)	feet 0	feet 456
No. 5 shaft	K.R.L.87	—47½°	3	0	2,011
No. 2 winze	—	—36°	3	250	1,252
No. 4 winze	—	Vertical	3	1,250	1,670

The No. 5 shaft was sunk 264 feet slope distance in 1962, to a vertical depth of 2,011 feet below the collar. The 1,950-foot level was established. Development work comprised: 1,568 feet of drifting; 967 feet of crosscutting; and 4,120 feet of raising. Total development footage to 31 December 1962 was as follows: 96,361 feet of drifts; 29,045 feet of crosscuts; 60,260 feet of raises. Diamond-drilling in 1962 consisted of 122 holes, totalling 12,450 feet, from underground.

The following is taken from the company annual report for the year ending 31 December 1962:

Production

During 1962 a total of 97,449 tons of ore was hoisted, of which 79,034 tons was milled, and 18,511 tons was hand-sorted as waste.

The 79,034 tons of ore milled yielded a recovery of 18,522.41 ounces of gold and 5,252.27 ounces of silver. The total value of this bullion, including \$190,317 E.G.M.A., was \$890,614, or \$11.27 per ton milled.

Exploration

North Mine

Exploratory drilling below the new deepest 1,950-foot level indicates the vein-dike structure continuing strongly with depth.

South Mine

Deep drilling indications in the South Mine are that the "50" vein system and the Main No. 1 shear extends well below the bottom 1,600-foot level.

A 2,000-foot crosscut will be driven from the 1,950-foot level to this area of the mine in 1963. The "50" vein has a potential strike length of 1,000 feet on the 1,950-foot level and a slope length of 700 feet between the 1,950- and 1,600-foot levels.

West Mine

A recent geological study by the Ontario Department of Mines of the rock formations on the west side of McKenzie Island has shown that the rocks are lavas (rhyolites) and not sediments as previously thought. Diamond-drilling from the 1,250-foot level and 1,450-foot level has confirmed this.

Drilling has picked up several high-grade narrow intersections in a strong shear at the contact between the rhyolite and the granodiorite. Results at the year's end were inconclusive but highly interesting. The shear has an area of 2,000 by 4,000 feet on the property.

Milling

To offset the rising costs of labour and material, a 6- by 9-foot primary ball mill will be added to the grinding circuit in 1963. Sorting labour, which is high, will be eliminated and the present mill capacity increased from 230 tons per day to 300 tons and then gradually to 330 tons per day.

Ore Position

In the older sections of the south mine there is an appreciable amount of quartz vein that has been developed by drifting and raising. It is not ore at our present maximum mill capacity of 230 tons per day, but with development paid for a portion of it, is ore at 330 tons per day.

With this potential ore, and ore developed on the new north mine levels, there is a minimum of two years' ore remaining above the 1,950-foot level.

The average number of employees was 114: 73 underground, and 41 on surface. P. J. McCarthy was manager.

MacLeod-Cockshutt Gold Mines Limited

MacLeod-Cockshutt Gold Mines Limited was incorporated in September 1933, with an authorized capitalization of 3,000,000 shares of \$1 par value, of which 2,862,490 shares have been issued. Late in 1958 control of the company was

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acquired by the Little Long Lac Gold Mines Limited interests. The directors and officers were: J. C. L. Allen, president and director; J. G. Boeckh, vice-president and director; J. C. Adamson, R. C. Stanley Jr., P. K. Hanley, and S. J. Bird, directors; Miss B. A. Argo, secretary. The head office is at 199 Bay Street, Toronto 1. The mine address is Geraldton.

The property, comprising twenty-four claims, is in Ashmore and Errington townships, District of Thunder Bay.

Mining and milling continued throughout 1962.

SHAFTS, MACLEOD-COCKSHUTT MINE

	Claim No.	Inclination	Number of Compartments	Total Depth from Surface
No. 1 shaft	T.B.10040	Vertical	3	feet 2,250
No. 2 shaft	T.B.10038	Vertical	4	1,921
No. 3 winze (below 11th level, inactive)	—	45°	3	2,001

Development work during the year consisted of 117 feet of drifting and 87 feet of crosscutting. Total development footage to 31 December 1962 was as follows: 105,448 feet of drifts; 28,856 feet of crosscuts; 34,743 feet of raises. Diamond-drilling in 1962 consisted of 36 holes, totalling 2,076 feet, from underground.

The foundation for a 72-inch ventilation fan was constructed and equipment installed.

New equipment added in 1962 included the following:

- 1 pump (10 x 8 x 10 in., Gardner-Denver) underground.
- 1 pump (6 x 3½ x 6 in., Gardner-Denver) underground.
- 4 pumps (6 x 4 x 6 in., Gardner-Denver) underground.
- 1 slusher motor (50-hp., Canadian General Electric) underground.
- 3 compressed air tuggers (size "0" and "1") underground.
- 1 rock drill (C.F. 93, Gardner-Denver) underground.
- 2 stoper drills (J.R. 38, Canadian Ingersoll-Rand) underground.
- 3 mine cars (60-cu. ft., Granby) underground.
- 1 generator (100-kw., Westinghouse) underground.
- 1 locomotive (6-ton, 2-motor, Goodman) underground.
- 1 skip bale (72½ C.F.).
- 1 motor (250-hp., John Inglis) mill.
- 1 bus (Ford Falcon 1962) on surface.

The following is taken from the company annual report for the year ending 31 December 1962.

During 1962, the mine produced 21,560.497 ounces of gold and 2,107.71 ounces of silver from 236,719 tons of ore, averaging 0.091 ounces of gold recovered per ton. Revenue from this production amounted to \$808,102 or \$3.41 per ton. Including an estimated \$75,570 E.G.M.A., the operating revenue was \$883,672 or \$3.73 per ton. In addition \$147,209 was received from Consolidated Mosher for the rental of equipment and use of facilities.

Ore from Consolidated Mosher was treated in the mill at an increasing daily rate as the MacLeod sources of ore diminished. The mill was thus kept operating at full capacity, permitting profitable production at the reduced average rate of 656 tons per operating day.

Ore reserves have been considerably reduced within the F zone, however, development during the year has added 20,000 tons of ore from the porphyry zone on the 5th, 6th, and 7th levels. At the year's end, the total recoverable reserves were estimated to be 280,716 tons, averaging 0.112 ounces of gold per ton.

It is anticipated that MacLeod's production in 1963 will average over 400 tons per day, with 1,500 tons per day being supplied by Consolidated Mosher.

Operating costs during the year were as follows:

Distribution	Amount	Per Ton
Mine development.....	\$ 5,251	\$0.0222
Mining.....	389,091	1.6437
Milling.....	191,866	0.8105
Marketing expense.....	6,300	0.0266
General expense at property.....	91,734	0.3875
Mine office and supervision.....	39,095	0.1651
Administration and corporation expense.....	33,153	0.1401
Ontario royalty tax.....	4,800	0.0203
Total Operating Expense.....	\$761,290	\$3.216

The average number of employees at the MacLeod and Consolidated Mosher operations was 340: 152 underground, and 188 on surface. H. E. Rudd was general manager.

Madsen Red Lake Gold Mines Limited

Madsen Red Lake Gold Mines Limited was incorporated in March 1935, with an authorized capitalization of 5,000,000 shares of \$1 par value. In June 1940, the capitalization was reduced to 3,500,000 shares of which 3,499,528 shares have been issued. The directors and officers were: M. K. Madsen, president and director; F. R. Marshall, vice-president and director; Miss Margaret Master-son, secretary-treasurer and director; H. H. Mackay, H. G. Young, and S. J. Bird, directors. The head office is at Room 1109, 55 Yonge Street, Toronto 1. The mine address is Madsen.

The company's main property comprising 58 claims, about 2,732 acres, is in Baird and Heyson townships, Red Lake area, District of Kenora (Patricia Portion). It is about 7½ miles southwest of the town of Red Lake.

Mining and milling operations continued throughout 1962.

SHAFTS, MADSEN RED LAKE GOLD MINE

	Claim No.	Inclination	Number of Compartments	Depth from Surface
No. 1 shaft.....	K.R.L.11505	Vertical	2 (inactive)	feet 573
No. 2 shaft.....	K.R.L.12528	Vertical	5	4,176

No. 2 shaft was sunk 300 feet in 1962 to a vertical depth of 4,176 feet below the collar. The 24th, crusher, and 25th levels were established at depths of 3,925, 3,985, and 4,060 feet, respectively, below the collar.

Development work in 1962 comprised: 11,235 feet of drifting; 837 feet of crosscutting; and 4,835 feet of raising. Total development footage to 31 December 1962 was as follows: 148,162 feet of drifts; 24,445 feet of crosscuts; 58,578 feet of raises. Diamond-drilling in 1962 consisted of 629 holes, totalling 125,546 feet, from underground.

New construction in 1962 included an addition (70- by 32-ft.), to the mill, and an addition (735 sq. ft.) to the assay office, both of frame construction.

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New equipment added included the following:

- 1 assay furnace (14.5 x 22 x 8.5 in., Williams and Wilson).
- 1 air compressor (XVHEZ, serial EL-62387, 2,790-cfm., Canadian Ingersoll-Rand).
- 1 automatic loading-station (Dorr-Oliver-Long).
- 1 truck (International, model R-210).

The following is taken from the company annual report for the year ending 31 December 1962:

Production

	1962	1961
Milled..... tons	311,705	301,031
Gold produced..... ounces	100,877.831	106,096.338

The total operating cost increased by \$2.298 per ounce over the previous year. The total mining and milling cost decreased by \$0.432 per ounce. Other costs increased over the previous year, particularly the development cost, by \$2.028 per ounce, and employees' benefits by \$0.357 per ounce.

The high labour turnover adversely affected the total operating costs. There were 280 hirings and 298 separations during the year, compared to 327 hirings and 299 separations in the previous year.

Ore Reserves

After milling 311,705 tons during the year, the ore reserve was increased by 178,540 tons to a total of 845,400 tons. The grade of the ore reserve was maintained at 0.33 ounces per ton.

The calculated ore reserve for 1962 and comparable ore reserve for 1961 are shown in the following table:

Block	31 December 1962			31 December 1961		
	Tons	Grade	Ounces	Tons	Grade	Ounces
Surface to 7th level.....	14,430	0.343	4,943	5,600	0.283	1,587
7th level to 11th level.....	36,903	0.344	12,704	32,440	0.277	8,988
11th level to 17th level.....	250,349	0.306	76,560	182,090	0.305	55,495
17th level to 22nd level....	481,545	0.345	166,237	363,750	0.361	131,390
Broken reserve.....	62,173	0.299	18,590	82,980	0.272	22,570
Total Reserves.....	845,400	0.330	279,034	666,860	0.330	220,030

All high assays were reduced to one ounce, and a dilution factor of 10 percent was allowed in the calculations.

Intensive research work indicated that future ores to be milled, especially from Austin No. 3 zone, will result in a slightly lower recovery of gold. This situation will be largely offset by treatment of deslimed tailings by flotation, regrinding the flotation concentrate, and subsequent cyanidation of flotation concentrate.

Accordingly, the necessary mill addition to house the flotation equipment was erected during the last two months of the year. The flotation circuit is expected to be in operation by June 1963, when the more refractory ore will be entering the ore stream.

Milling

The milling data, for the current year, the two previous years, and the total since the commencement of milling operations are shown in the table below:

	1962	1961	1960	11 Aug., 1938 to 31 Dec., 1962
Treated..... dry tons	311,705	301,031	306,377	5,522,531
Operating time..... percent	98.11	97.58	98.04	96.11
Treated per calendar day..... tons	853.99	824.74	837.04	619.88
Average heads..... oz. per ton	0.35108	0.37746	0.4092	0.31342
Average tails..... oz. per ton	0.02748	0.02502	0.02505	0.018807
Recovery..... percent	92.17	93.37	93.95	94.00

OPERATING COSTS

Distribution	1962			1961		
	In Full	Cost per Ton Milled	Cost per Ounce Produced	In Full	Cost per Ton Milled	Cost per Ounce Produced
Development and exploration.....	\$899,190.87	\$ 2.604	\$ 8.045	\$723,629.14	\$ 2.121	\$ 6.017
Less portion deferred.....	87,636.18	3.304	10.209	85,246.19	3.671	10.414
Stopping and stope preparation.....	\$ 811,554.69	1.738	5.371	\$ 638,382.95	1.957	5.552
Mucking, tramping, and hoisting.....	1,029,902.60	0.250	0.772	1,104,962.93	0.311	0.885
Crushing and conveying.....	541,842.66	1.049	3.240	589,081.03	1.118	3.173
Milling.....	77,874.99	0.784	2.422	93,895.30	0.746	2.117
Mine general expense.....	326,885.52	1.082	3.341	336,652.43	1.052	2.984
Employees' benefits.....	244,337.75	0.216	0.667	224,654.46	0.221	0.627
Head office expense.....	337,030.83	0.093	0.287	316,507.38	0.101	0.287
Marketing charges.....	67,241.07			66,520.02		
	28,934.73			30,413.05		
Total.....	\$3,465,624.84	\$11.120	\$34.354	\$3,401,069.55	\$11.298	\$32.056
Deduct estimated E.G.M.A.....	685,000.00	2.198	6.790	590,000.00	1.960	5.561
Net Total.....	\$2,780,624.84	\$8.922	\$27.564	\$2,811,069.55	\$9.338	\$26.495

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Mining

Stoping operations were carried out between the 2nd level and 21st level, with 81.7 percent of the mill feed coming from sources above the 17th level or 2,700-foot horizon. Particular attention was given to the cleaning up of the ore from these upper levels.

The tonnage of deslimed mill tailings placed as backfill during the year amounted to 115,181 tons; making a total of 1,088,870 tons placed as backfill to date.

The average number of employees was 411: 244 underground, and 167 on surface. A. A. McCloskey was mine consultant; E. G. Crayston was general manager.

Pamour Porcupine Mines Limited

Pamour Porcupine Mines Limited was incorporated in March 1934. The authorized capitalization is 5,000,000 shares of no par value, all of which have been issued. The directors and officers were: J. R. Bradfield, president and director R. V. Porritt, vice-president and director; J. R. Timmins, L. H. Timmins, Hon. D. R. Michener, K. C. Gray, and W. S. Row, directors; C. H. Windeler, secretary; R. G. Rudolf, treasurer; J. O. Hinds, assistant-secretary; E. K. Cork, assistant-treasurer; A. H. Zimmerman, comptroller. The executive office is at 1700 Bank of Nova Scotia Building, Toronto. The head office and mine offices are at Pamour.

The company's main property, totalling thirty-three claims, is in Whitney and Murphy townships, Porcupine area, District of Cochrane. It includes the former La Palme Porcupine, Three Nations, and Porcupine Grande properties.

Mining and milling continued throughout 1962.

SHAFTS, PAMOUR MINE

	Claim No.	Inclination	Number of Compartments	Total Depth from Surface
No. 1 shaft (inactive).....	P.13793	Vertical	2	feet 110
No. 2 shaft (inactive).....	P.13793	Vertical	2	220
No. 3 shaft.....	P.13783	Vertical	5	3,144
No. 4 internal shaft (below 600-foot level).....	—	Vertical	3	2,437

Development work during the year consisted of: 6,821 feet of drifting; 1,173 feet of crosscutting; and 4,512 feet of raising. Total development footage to 31 December 1962 was as follows: 167,485 feet of drifts; 38,959 feet of crosscuts; 110,723 feet of raises. Diamond-drilling consisted of 373 holes, totalling 58,100 feet, from underground; and two holes, totalling 697 feet, from surface.

New equipment installed in heating plant included two oil-fired Package boilers (70-hp., Babcock-Willcox, Galt).

The following is taken from the company annual report for the year ending 31 December 1962:

Development

Lateral development consisted of 3,210 feet in lava exploration, 1,085 feet in east greywacke, 370 feet in west greywacke, and 1,300 feet in conglomerate.

In the east end of the mine, 1,195 feet of drifting was in ore with an average grade of 0.118 ounces of gold per ton over drift width. In the west end of the mine, 100 feet of drifting was in ore with an average grade of 0.108 ounces of gold per ton over drift width.

Stoping

Stoping was carried on in both the east and west sections of the mine. Twenty percent of the ore produced was from lava stopes. The east end provided 70 percent of the tonnage broken and milled.

Cut-and-fill stopes provided 12 percent of the ore broken, slusher stopes 20 percent, blast-hole stopes 10 percent, and shrinkage stopes the remainder.

Ore Reserves

	Ore	Grade
	tons	oz. per ton
BROKEN		
East end.....	497,500	0.095
West end.....	165,700	0.099
Total.....	663,200	0.096
ORE IN PLACE		
East end.....	647,800	0.100
West end.....	328,700	0.123
Total.....	976,500	0.108
Total east-end ore.....	1,145,300	0.098
Total west-end ore.....	494,400	0.115
Total.....	1,639,700	0.103

Allowance for normal dilution has been made in calculating the tonnage and grade of ore reserves.

After milling 632,700 tons, total ore reserves were maintained at approximately the same tonnage and grade as at the end of the previous year.

Mill

	1962	1961
Milled..... tons	632,700	647,600
Milled per calendar day..... tons	1,733	1,774
Average gold content..... oz. per ton	0.108	0.102
Average tailings loss..... oz. per ton	0.010	0.010
Total recovery..... percent	90.5	90.5
Total production gold..... oz.	62,140	59,780
Value of total production.....	\$2,335,000	\$2,132,000

The average number of employees was 358: 195 underground, and 163 on surface. W. J. Marshall was manager.

Paymaster Consolidated Mines Limited

Paymaster Consolidated Mines Limited was incorporated in February 1930, with an authorized capitalization of 9,000,000 shares of \$1 par value, of which 8,629,090 shares have been issued. The directors and officers were: W. C. Ringsleben, president and managing director; H. D. Rothwell, vice-president and director; C. E. Cook, L. G. Sams, Marshall Stearns, S. A. Caldbick, and A. J. Feuer, directors; A. C. Buckley, secretary-treasurer. The head office and mine office are at South Porcupine, P.O. Box 100.

The main property, comprising 751.6 acres, is in Deloro and Tisdale townships, Porcupine area, District of Cochrane.

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Mining and milling continued throughout 1962.

SHAFTS, PAYMASTER MINE

	Claim No.	Inclination	Number of Compartments	Collar Depth	Vertical Depth from Surface
				feet	feet
No. 1 shaft.....	T.R.S.776	Vertical	2 (inactive)	Surface	80
No. 2 shaft.....	T.R.S.776	Vertical	2 (inactive)	Surface	814
No. 3 shaft.....	T.R.S.776	Vertical	4 (inactive)	Surface	400
No. 4 shaft.....	H.S.747	Vertical	2 (inactive)	Surface	253
No. 5 shaft.....	P.14115	Vertical	3	Surface	4,401
No. 6 shaft.....	P.13128	60°	2 (inactive)	Surface	417
No. 7 shaft.....	P.14114	Vertical	2 (filled)	Surface	75
No. 8 shaft.....	P.14115	Vertical	2 (filled)	Surface	185
No. 9 shaft.....	P.14115	Vertical	1 (inactive)	Surface	185
No. 1 winze.....	—	75°	2 (inactive)	1,050	1,206
No. 2 winze.....	—	Vertical	2 (inactive)	1,050	1,632
No. 3 winze.....	—	Vertical	2 (inactive)	1,050	2,120
No. 4 winze.....	—	Vertical	2 (inactive)	400	1,015
No. 5 winze.....	—	Vertical	3	2,075	4,230
No. 5 winze.....	—	Vertical	3	4,075	4,501

The sinking of No. 5 shaft was commenced, and 76 feet were completed in 1962, to a depth of 4,401 feet below the collar. Preparations were also underway to deepen No. 6 winze.

Development work during the year included: 1,795 feet of drifting; 699 feet of crosscutting; and 1,387 feet of raising. Total development footage to 31 December 1962, was as follows: 184,009 feet of drifts; 79,527 feet of crosscuts; 61,666 feet of raises. Diamond-drilling consisted of 144 holes from underground, totalling 30,780 feet.

A total of 157,630 tons of ore was hoisted; 157,992 tons were milled at a daily average of 432.9 tons in 1962.

The following is taken from the company annual report for the year ending 30 June 1962:

Mining

New ore developed during the year totalled 460 feet having an average width of 85 inches and an average cut grade of 0.26 ounces per ton.

Stoping was done: from No. 5 winze between the 2,700- and 4,075-foot levels on Nos. 18, 24, and 31 veins; from No. 5 shaft between the 3,300- and 4,075-foot levels on Nos. 36 and 37 veins; and from No. 6 winze levels on Nos. 36 and 37 veins also.

Sources of ore during the year were as follows: development 4.1 percent; No. 5 winze, 45.1 percent; No. 5 shaft, 23.3 percent; and No. 6 winze, 27.5 percent.

Exploration of the No. 2 shaft area at depth by means of long crosscuts to the south of the No. 5 shaft workings, was commenced on the 2,575- and 4,075-foot levels. No. 2 shaft workings, which are 800 feet deep, are flooded. During World War II, a long drive on the 2,575-foot level, extending almost 5,000 feet south from No. 5 shaft for the purpose of exploring at depth, was abandoned because of war-time restrictions. This drive, which is partially caved, is being reconditioned, and a similar drive was started from the 4,075-foot level. These drives must cross several hundred feet of serpentine rock of a soft caving nature, which requires special support; and advance is necessarily somewhat slower than normal crosscutting.

Deep drilling below the 4,375-foot level has shown some encouragement of downward extension of Nos. 36 and 37 veins, and diamond-drill intersections of ore grade of mining width have been obtained to a depth of 1,600 feet below the 4,375-foot level. This exploration by diamond-drilling at depth is being continued to determine if there is sufficient indication of ore to warrant the deepening of No. 6 winze.

Ore Reserves

	Tons	Grade
Probable ore.....	219,020	0.230
Positive ore.....	29,925	0.230
Broken ore.....	11,055	0.279
Total.....	260,000	0.232

Ore reserves decreased 131,427 tons as compared with 30 June 1961, and the over-all grade is down slightly from 0.234 to 0.232 ounces per ton.

Milling

During the fiscal year, 176,502 tons ore were milled. The average milling rate was 483.5 tons per calendar day, as compared with 513.0 tons per calendar day in the previous year.

The main reason for the decline in tonnage is that some of the new stopes that came into production were not capable of replacing the tonnage of the stopes that were mined out. As noted above, the proportion of ore mined from No. 6 winze stopes was increased, while the proportion from No. 5 winze, No. 5 shaft, and from development was decreased as compared with the previous year.

Costs

Following is an analysis of the operating costs:

	Total Cost	Cost per Ton Milled
Diamond-drilling.....	\$ 7,451.02	\$0.04
Drifting.....	34,176.06	0.19
Crosscutting.....	4,337.30	0.02
Raising.....	40,255.17	0.23
Special underground exploration.....	111,147.60	0.63
Mining.....	1,081,318.24	6.13
Ore transportation.....	17,086.06	0.10
Crushing.....	50,125.16	0.28
Milling.....	253,557.61	1.44
General expense.....	164,236.14	0.93
Total.....	\$1,763,690.36	\$9.99

The average number of employees was 271: 186 underground, and 85 on surface. L. K. Walkom was general manager.

Pickle Crow Gold Mines Limited

Pickle Crow Gold Mines Limited was incorporated in January 1934. In April 1959, the capitalization was increased to 5,000,000 shares of \$1 par value, of which 3,554,806 shares have been issued. The directors and officers were: N. B. Keevil, president and director; C. G. MacIntosh, vice-president and director; R. M. Butler, secretary and director; J. C. Perry and J. H. Westell, directors; D. S. Brown, treasurer. The head office is at Suite 1000, 11 Adelaide Street West, Toronto 1. The mine address is Pickle Crow.

The property consists of ninety-six claims in Connell and McCullagh townships, Pickle Lake area, District of Kenora (Patricia Portion).

Mining and milling continued throughout 1962.

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SHAFTS, PICKLE CROW MINE

Shaft	Claim Number	Inclination	Number of Compartments	Collar Depth	Vertical Depth below Surface
No. 1	747	Vertical	3 to 1,200 ft. 4 from 1,200 to 2,450 ft. 3 from 2,450 to bottom	feet Surface	feet 3,042
No. 3	2062	Vertical	3 to 1,554 ft. 4 from 1,554 to 2,600 ft. 3 from 2,600 to bottom	Surface	3,025
No. 2	—	Vertical	2 (inactive) 3 from 2,900 to 3,707 ft.	721	1,518
No. 4	—	Vertical	4 from 3,707 to bottom	2,900	4,038

No. 4 shaft was sunk 895 feet in 1962 for a total depth of 1,138 feet and a vertical depth of 4,038 feet below surface. The 3,050-, 3,200-, 3,350-, and 3,800-foot levels were established at depths of 150, 300, 450 and 800 feet, respectively, below the collar. The 3,000-foot level was established 2,980 feet below the collar of No. 3 shaft.

Development work during the year included: 1,665 feet of drifting; 1,862 feet of crosscutting; and 1,132 feet of raising. Total development footage to 31 December 1962 was as follows: 69,791 feet of drifts; 52,685 feet of crosscuts; 42,050 feet of raises. Diamond-drilling in 1962 consisted of 91 holes, totalling 22,211 feet, from underground; and 11 holes, totalling 3,039 feet, from surface.

New construction consisted of an addition to the mill (24 x 24 x 27 ft.), and an assay office (39 x 19 x 16 ft.), both of wood frame construction.

The following is taken from the company annual report for the year ending 31 December 1962:

Operating Costs

A comparative analysis of operating cost for the past two years follows:

	In Full		Per Ton Ore Treated		Per Ounce Gold Recovered	
	1962	1961	1962	1961	1962	1961
Development	\$ 185,411	\$ 203,547	\$ 1.66	\$ 1.63	\$ 4.60	\$ 4.20
Mining	810,171	896,616	7.24	7.18	20.09	18.51
Milling	220,369	234,185	1.97	1.88	5.46	4.83
General mine expense	222,288	202,346	1.99	1.62	5.51	4.18
Administrative expense	46,640	46,829	0.42	0.37	1.16	0.97
Total	\$1,484,879	\$1,583,523	\$13.28	\$12.68	\$36.82	\$32.69

Production

Total bullion production amounted to \$1,515,073 or a recovery of \$13.55 per ton milled. A comparison of milling results to that of the previous year is as follows:

	1962	1961
Milled tons	111,781	124,821
Gold recovered oz.	40,328	48,447
Silver recovered oz.	4,110	5,000
Gold recovered per ton oz.	0.3608	0.3881
Recovery percent	98.89	98.98

Ore Reserves

Ore reserves at the year's end totalled 303,553 tons with a grade of 0.351 ounces of gold per ton. This compares with the reserves for the previous year, which totalled 323,105 tons grading 0.375 ounces per ton. The slight reduction in ore reserves reflects the intensified sinking and station-cutting program at No. 4 shaft during the year, where only the No. 9 vein was developed on the 3,050- and 3,200-foot levels. This work proved a total of 33,500 tons of ore, grading 0.288 ounces of gold per ton.

Reserves	1 January 1963		1 January 1962	
	Ore Reserves	Gold at \$35 per oz.	Ore Reserves	Gold at \$35 per oz.
Broken ore	tons 51,073	\$11. 87	tons 39,715	\$13. 38
Developed ore	241,680	12. 44	271,740	13. 18
Probable ore	10,800	11. 12	11,650	10. 62
Total	303,553	\$12. 30	323,105	\$13. 11

Stoping

Stoping production amounted to 105,182 tons, or 94.1 percent of the total tonnage milled. The remaining 6,599 tons, 5.9 percent, came from development. Ore produced from the various veins is tabulated below.

Vein	Ore	Total	Grade	Value per ton (gold at \$35 per ounce)
	tons	percent	oz. per ton	
No. 1	15,722	14.07	0.23	\$ 8.11
No. 2	12,958	11.59	0.53	18.68
No. 5	35,255	31.54	0.38	13.36
No. 6	12,069	10.80	0.40	13.97
No. 7	8,092	7.24	0.30	10.63
No. 8	256	0.23	0.24	8.43
No. 9	22,058	19.73	0.36	12.76
No. 13	5,371	4.80	0.14	4.98
Total and Average	111,781	100.00	0.36	\$12.57

In order to reduce dilution in stopes, hydraulic backfill with cut-and-fill mining is to be used on No. 1 and No. 4 shaft stoping areas. In preparation for this, a tailings backfill plant was started, and was 40 percent completed at the year's end. The mill building was extended to house the tailings storage tank, and from surface down, 1,117 feet of diamond-drilling for tailings transfer was completed.

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General

Pickle Crow Gold Mines was awarded the John T. Ryan Trophy for the lowest accident frequency among metalliferous mines in Ontario during 1962. A second award was given by the National Safety Council in recognition of the mine's achievement in prevention of injuries from falls of ground.

The average number of employees was 226: 124 underground, and 102 on surface. A. E. Cave was mine manager; C. H. Howey was mine superintendent.

Pitchvein Mines Limited

Pitchvein Mines Limited was incorporated in March 1953, with an authorized capitalization of 5,000,000 shares of \$1 par value, of which 4,238,760 shares have been issued. The officers and directors were: D. F. Hurd, president and managing director; T. R. Rowe, vice-president and director; E. F. Carr, director; J. R. McDougall, secretary-treasurer. The head office and mine office is at 82 Government Road West, Kirkland Lake.

The property consists of sixteen claims in Melba township, District of Timiskaming.

Former work consisted of sinking the No. 1 inclined (55 degree), two-compartment shaft in claim L.59506, a distance of 248 feet. The 225-foot level was established at a vertical depth of 185 feet, on which a total of 982 feet of drifting, and 127 feet of crosscutting had been completed.

Development work in 1962 consisted of some 20 feet of surface-trenching averaging 4 feet in depth. Three diamond-drillholes, totalling 1,705 feet were completed from surface.

D. F. Hurd, president and managing director was in charge; two men were employed during the period of operation.

Preston Mines Limited

Preston East Dome Mines Limited was incorporated in January 1911, reorganized in February 1936 and in September 1957. In August 1960, the name was changed to Preston Mines Limited, on the amalgamation of Preston East Dome Mines with Stanleigh Uranium Mining Corporation Limited. The capitalization was increased to 5,000,000 preference shares of 0.50 par value and 10,000,000 common shares of no par value, of which 3,930,075 preference and 6,728,000 common shares have been issued. The company is controlled by Rio Tinto Mining Company of Canada Limited. The directors and officers were: Hon. R. H. Winters, president and director; W. B. Malone, vice-president and director; R. D. Lord, managing director; J. I. Crookston, W. H. Bouck, H. L. Roper, G. B. Langford, W. C. Pitfield, and W. P. Arnold, directors; George Baker, secretary; D. A. Macfarlane, treasurer; G. R. Devey, assistant secretary; G. A. Roy, assistant treasurer. The head office is at 335 Bay Street, Toronto. The mine office is at South Porcupine.

The property, comprising eighteen claims immediately south and east of the Dome mine, is located in Tisdale and Deloro townships, Porcupine area, District of Cochrane. In 1959 the company acquired the property of Midcamp Mines Limited, consisting of 355 acres, adjoining the Paymaster and Preston mines.

Mining and milling operations continued throughout 1962.

SHAFTS, PRESTON MINE

	Claim No.	Inclination	Number of Compartments	Total Depth from Surface
No. 1 shaft (escape)	P.13151	63°	2	feet 95
No. 2 shaft	P.13151	Vertical	5	2,388
No. 3 internal shaft (below 2,166 feet) . .	—	Vertical	3 from collar to 69 feet above 28th level; 4 to bottom	4,170
No. 4 shaft (inactive)	P.12971	Vertical		

Development work during the year consisted of: 3,093 feet of drifting; 3,232 feet of crosscutting; and 1,918 feet of raising. The total development footage to 31 December 1962 was as follows: 122,257 feet of drifts; 157,705 feet of cross-cuts; 63,548 feet of raises. Diamond-drilling in 1962 consisted of 572 holes, totalling 51,662 feet, from underground.

The following is taken from the company annual report for the year ending 31 December 1962:

Production

The following are the main milling statistics for the year:

Milled	tons	201,440
Average per day	tons	685
Gold produced	oz.	40,502.0
Silver produced	oz.	4,442.9
Average millheads	oz. per ton	0.207
Average net recovery	oz. per ton	0.201
Average gold in tailings	oz. per ton	0.0063
Average recovery	percent	97.0

The average grade of ore realized during the year was 0.207 ounces, close to the estimated grade of 0.210. An increase in tailings loss, from 0.0054 to 0.0063 ounces per ton, resulted from the increased volume of sulphide ore from Midcamp forming an increased proportion (48.2 percent) of the tonnage milled.

Costs

Mine operating costs per ton milled were as follows:

Development and diamond-drilling	\$1.81
Mining	5.80
Milling	1.27
	<u>\$8.88</u>

The operating cost of \$8.88 per ton milled compares to \$8.56 for the previous year when tonnage milled was 7 percent higher. The lower production in 1962 from the original Preston workings, and increased proportion of mill feed from the more remote Midcamp area, resulted in the lower tonnage treated.

Development

Total ore developed in 1962 amounted to 1,352 feet, of which 1,029 feet was in the Midcamp zone. The average width of ore developed was 4.8 feet, with an average grade of 0.20 ounces per ton.

Development ore accounted for 7.8 percent of that produced, and broken reserves at the year's end stood at 23,170 tons.

Development of the Midcamp greenstones continued throughout the year. A total of 13 stopes are now in regular production between the 18th and 12th levels, and development of the zone between the 21st and 18th levels is in progress. Grade control continues to demand close attention in the Midcamp zone owing to absence of visual limits to the ore.

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Ore Reserves

Ore reserves at 31 December 1962 totalled 466,012 tons of an average grade of 0.20 ounces per ton. This is a decrease of 80,400 tons compared with the reserves at the end of 1961.

Two-thirds of the indicated ore reserves are located in the Midcamp area. Computation of these reserves is still being approached on a conservative basis, due to difficulty in outlining ore. Below the 18th level only 52,500 tons are included in total reserves as development is incomplete.

With the exception of the Porphyry Greenstones area, very little new ore has been developed in the original Preston claims.

The experience gained from extensive exploratory drilling and development on the original Preston claims for the past three years has not been encouraging. Some of the major producing zones such as the Preston Porphyry, North Greenstones, and part of the Porphyry Greenstones have, due to the northeasterly plunge, moved off the property. The lower West Porphyry has been unproductive below the 25th level.

No. 27 North Drive is being extended to explore the remaining portion of the Porphyry Greenstones above this horizon.

Steps are now being taken to explore the possible upward extension of the Midcamp ore zones above the 9th level.

Deep drilling to probe for additional porphyries on the Midcamp ground is being considered.

The average number of employees was 309: 218 underground, and 91 on surface. G. F. Greenacre was mine manager.

Renabie Mines Limited

Renabie Mines Limited was incorporated in January 1941, with an authorized capitalization of 1,500,000 shares of \$1 par-value, of which 1,050,005 have been issued. The company is a subsidiary of Macassa Mines Limited. The officers and directors were: R. A. Bryce, president and director; J. D. Bryce, executive vice-president and director; P. K. Hanley, J. C. L. Allen, J. G. Boeckh, Larmour Soliague, and C. C. Huston, directors; H. W. Salthouse, secretary-treasurer. The head office is at 85 Richmond Street West, Toronto 1. The mine address is Renabie.

The property comprises 33 claims, about 887 acres, located in Rennie and Leeson townships, District of Sudbury.

Mining and milling continued throughout 1962.

SHAFTS, RENABIE MINE

	Claim No.	Inclination	Number of Compartments	Total Depth from Surface
No. 1 shaft	S.34314 (Leeson Twp.)	Vertical	3	feet 281
No. 2 shaft	S.34317 (Leeson Twp.)	Vertical	3	2,859

No. 2 shaft was sunk 348 feet in 1962 to a depth of 2,859 feet below the collar. The 2,625- and 2,805-foot levels were established at depths of 2,630 and 2,810 feet, respectively. Development work during the year consisted of: 1,665 feet of drifting; 1,873 feet of crosscutting; and 2,422 feet of raising. Total development footage to 31 December 1962 was as follows: 32,701 feet of drifts; 16,670 feet of crosscuts; 22,051 feet of raises. There was also 21,633 cubic feet of rock removed for level stations, 13,928 cubic feet for pumping stations, and 6,800 cubic feet for a loading pocket. Diamond-drilling in 1962 consisted of 120 holes, totalling 20,726 feet, from underground.

New construction in 1962 consisted of a two-storey office (56 x 32 x 18 ft.), and single-storey warehouse (119 x 32 x 10.5 ft.), of frame construction.

Added equipment was as follows:

- 2 rocker shovels (model 21, 24-in. gauge, Eimco).
- 2 locomotives (Mancha 1½-ton).
- 6 ore cars (Granby type, 60-cu. ft., Robt. Hudson, Leeds, England).

The following is taken from the company annual report for the year ending 31 December 1962:

Milling

The average tons milled per day in 1962 was 542.5 as compared to 548.5 in 1961. Bullion recovery comprised 35,735.343 ounces of gold, and 12,073.12 ounces of silver.

From the commencement of milling operations in July 1947, 2,469,685 tons of ore have been milled, from which has been recovered 526,170.977 ounces of gold and 161,981.40 ounces of silver, having a gross recovered value of \$18,549,513.13 equivalent to \$7.51 per ton milled, exclusive of cost-aid.

The over-all milling costs for the year increased to \$1.59 per ton from \$1.56 per ton in 1961.

The recovery decreased from 94.1 percent in 1961 to 93.9 percent in 1962. In September the value of the insoluble tails increased, and despite numerous laboratory tests and experiments in the mill circuit it has remained higher than normal. Assistance has been sought from Macassa Gold Mines and from the Mines Branch of the Department of Mines and Technical Surveys, Ottawa; and it is felt that a permanent solution should be forthcoming soon.

Ore Reserves

The technical position of ore reserves at the year's end, after allowing for dilution, and elimination of any doubtful or marginal ore, and without including any ore below the 2,000-foot level, was as follows:

	Ore	Grade	Value (Gold at \$35 per ounce)
	tons	oz. per ton	
Unbroken ore.....	213,460	0.203	\$7.11
Broken ore.....	80,777	0.213	7.46
Total.....	294,237	0.206	\$7.21

Operating Costs

The operating and other costs per ton and per ounce of gold recovered were as follows:

	1962		1961	
	35,735.343 ounces recovered from 198,019 tons milled		37,934.49 ounces recovered from 200,215 tons milled	
	per ton	per ounce	per ton	per ounce
Development and exploration.....	\$1.50	\$ 8.28	\$1.70	\$ 8.98
Mining.....	2.63	14.60	2.81	14.85
Milling.....	1.59	8.82	1.56	8.21
Administration and head office....	0.54	2.98	0.50	2.65
Operating costs.....	6.26	34.68	6.57	34.69
Depreciation.....	0.52	2.87	0.51	2.68
Provision for taxes.....	0.03	0.17	0.03	0.15
Total Costs.....	\$6.81	\$37.72	\$7.11	\$37.52

The average number of employees was 179: 81 underground, and 98 on surface. W. A. Moore was mine manager.

Stairs Exploration and Mining Company Limited

Stairs Exploration and Mining Company Limited was incorporated in March 1962 with an authorized capitalization of 5,000,000 shares of \$1 par value, of which 1,700,005 shares have been issued. The directors and officers were: I. C. Stairs, president and director; G. P. Stairs, vice-president and director; E. G. Byrne, R. S. Sale, and E. F. Stairs, directors; Miss M. A. Calnan, secretary-treasurer. The head office is at Suite 706, 55 Yonge Street, Toronto 1. The mine address is Matachewan, c/o General Delivery.

The property is a gold prospect consisting of 161 claims located in Midlothian township, District of Timiskaming.

Operations proceeded from 15 October to 19 December, 1962.

In November a 7- by 10-foot adit on claim No. 26662, inclined at -20 degrees was driven 139 feet to intersect the main zone at 100 feet vertical depth. A length of some 300 feet of surface-trenching averaging 2.5-3 feet in depth was completed. Diamond-drilling consisted of 26 surface holes, totalling 11,051 feet.

New construction in 1962 included: a combined bunkhouse and cookery (52 x 35 ft.); a diesel-generator house (12 x 10 ft.); a compressor house (16 x 10 ft.); a machine shop (20 x 20 ft.); all frame construction.

New equipment included the following:

- 1 air compressor (600-cfm. Gardner-Denver, Rotair).
- 3 rock drills (Gardner-Denver, Jackleg).
- 1 Delco diesel-generator (10-kva., Lister).
- 1 double-drum slusher (15-hp., Gardner-Denver).

Mr. Jack McKinney was mine manager, and 13 men were employed during the period of operation.

Teck-Hughes Gold Mines Limited

Teck-Hughes Gold Mines Limited was incorporated in March 1923, with an authorized capitalization of 5,000,000 shares of \$1 par value, of which 4,862,144 shares have been issued. The officers and directors were: N. B. Keevil, chairman of the board and director; J. C. Perry, president and director; R. M. Butler, secretary and director; J. W. Stephenson, treasurer and director; W. H. Keith, G. L. Jennison, and D. A. Perigoe, directors. The head office address is Woodstock. The executive office is at 11 Adelaide Street West, Toronto. The mine address is Kirkland Lake.

Teck-Hughes Gold Mines Limited acquired, in 1960, the adjoining Kirkland Minerals Corporation Limited property, which comprised eleven claims. With this addition the Teck-Hughes property now consists of forty-four claims in Teck township, Kirkland Lake area, District of Timiskaming. The shafts on the former Kirkland Minerals property are shown in the 1960 report for that company. The reported total development footage completed by Kirkland Minerals up to the time of mine closure, 27 August 1960, was transferred, and is now included in Teck-Hughes totals.

Mining and milling continued throughout 1962.

SHAFTS, TECK-HUGHES MINE

	Claim No.	Inclination	Number of Compartments	Total Depth from Surface
South shaft.....	16625	Vertical	4	feet 3,690
South shaft extension (below 30th level)	—	Vertical	4	5,546
10th level winze (below 10th level) (inactive).....	—	Vertical	3	2,020
No. 2 winze (below 30th level) (inactive).....	—	60°	3	4,900
No. 3 winze (below 40th level).....	—	60°	3	6,182
No. 4 winze (below 30th level).....	—	Vertical	3	4,538
Central shaft.....	16626	Vertical	4	3,014
Central shaft extension (below 25th level) (inactive).....	—	Vertical	3	3,625
No. 1 shaft (inactive).....	L.1238	Vertical	2	490
No. 1 winze (below 5th level) (inactive)	—	Vertical	2	1,150

At present the south shaft extension is caved between the 33rd and 36th levels, and inactive between the 30th and 33rd levels. A double-drum air hoist was installed on the 36th level to service the levels to the bottom or 45th level.

During the year, 1,776 feet of drifting, 399 feet of crosscutting, and 1,742 feet of raising was completed. Total development footage to the end of the year was as follows: 258,987 feet of drifts; 96,156 feet of crosscuts; 115,848 feet of raises. Some 124 diamond-drillholes, totalling 5,811 feet, were completed during 1962 from underground. A total of 132,328 tons of ore was hoisted; the mill treated 132,440 tons, averaging 363 tons daily.

The following is taken from the company annual report for the year ending 30 September 1962:

Production

During the period, 128,500 tons of ore was milled. Recovery of bullion amounted to 23,997.116 ounces of gold and 3,693.18 ounces of silver, valued at \$894,090, or \$6.96 per ton. Operating costs amounted to \$1,119,378, or \$8.71 per ton, which when reduced by E.G.M.A. of \$255,652, resulted in a cost of \$863,726, or \$6.72 per ton, and an operating profit of \$30,364.

Operating Costs

A comparison of costs for the fiscal years 1962 and 1961 follows:

Distribution	In Full		Per Ton of Ore Treated		Per Ounce of Gold Produced	
	1962	1961	1962	1961	1962	1961
Development.....	\$ 143,597	\$ 169,165	\$1.12	\$1.06	\$ 5.984	\$ 6.117
Mining.....	658,687	643,478	5.13	4.04	27.448	23.269
Milling.....	224,181	252,704	1.74	1.59	9.342	9.138
General expense.....	92,913	99,166	0.72	0.63	3.872	3.586
Depreciation.....	—	679	—	—	—	0.025
Total.....	\$1,119,378	\$1,165,192	\$8.71	\$7.32	\$46.646	\$42.135
Tons ore treated.....	128,500	159,155	—		—	

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Development

Total development footage decreased about 9 percent compared with the previous twelve-month period.

Approximately 47 percent of the 1962 footage was driven in the former Kirkland Minerals property on eight different levels between No. 8 and No. 40 levels. As in the previous year much of the drifting and crosscutting was done in barren wall rock, making connections between the two properties and bypassing caved sections of old levels.

New ore developed on levels, totalled 197 feet, averaging 0.40 ounces per ton over 6.5 feet as follows:

	FEET
No. 8 level, No. 3 vein.....	37
No. 17 level, No. 3 vein.....	31
No. 20 level, No. 3 vein.....	67
No. 22 level, No. 3 vein.....	46
No. 32 level, No. 3 vein.....	16

Ore and low grade sent to the mill from drifting and crosscutting totalled 3,117 tons, compared to 2,563 tons the previous year. Of the 3,189.5 feet driven in subdevelopment and raises, 1,461 feet or about 46 percent was in ore.

Incline haulage connections were made to the Kirkland Minerals workings on No. 32 and No. 33 levels. A similar connection was started on No. 40 level. A long drive on, or close to, the main break was made to the centre of the Kirkland Minerals property on No. 22 level, to explore an undeveloped portion of the main break, and to investigate slough possibilities farther west. This work is nearing completion. To date one small oreshoot has been found and stoping started. A continuation of the high-grade K vein has been located below No. 31 level horizon in the Kirkland Minerals ground and is currently being developed for stoping, with encouraging results. Above No. 18 level in the centre of the Teck-Hughes property, the upward extension of the rich 19U vein, and its junction with the main break is being explored by raising in high-grade ore. An oreshoot exposed last year in an extension of No. 20 level into the Kirkland Minerals ground, has been further developed by raises and subdrifts, and stoping started in two areas. Diamond-drilling of both properties, in search of subsidiary veins and extensions to known orebodies, was continued on numerous levels between No. 5 and No. 40. Some 363 feet were drilled for drainage purposes. An additional 609 feet were drilled in locating the exact position of old, inaccessible workings. Although no new veins were discovered, a number of encouraging intersections were obtained; which require development to fully evaluate.

Ore Reserves

Ore reserves at 30 September compare as follows:

Source	Ore Reserve		Gold Content		Average Grade	
	1962	1961	1962	1961	1962	1961
	tons	tons	ounces	ounces	oz. per ton	oz. per ton
POSITIVE ORE						
Blocked.....	58,190	58,632	22,605.0	22,872.0	0.388	0.390
Broken.....	28,732	28,378	8,682.5	5,777.1	0.302	0.203
Total.....	86,922	87,010	31,287.5	28,649.1	0.360	0.330
POTENTIAL ORE						
Blocked..... ⁽¹⁾	10,815	4,493	3,661.7	1,998.7	0.338	0.445
Broken.....	5,700	9,830	585.0	3,966.6	0.103	0.403
Total.....	16,515	14,323	4,246.7	5,965.3	0.257	0.416
Grand Total.....	103,437	101,333	35,534.2	34,614.4	0.343	0.341

⁽¹⁾Includes some probable ore.

Unless otherwise indicated, potential ore refers to proven ore in old workings, which may not be recoverable economically when the proper time comes. Such ore is transferred to positive, or dropped altogether as changing conditions indicate.

A substantial portion of the above reserve, mostly broken, is not available at present because of the effect on nearby active workings.

Mining

The sources of ore milled during the twelve months ending 30 September are shown below:

Section	Total		Gold Content		Average Grade	
	1962	1961	1962	1961	1962	1961
	tons	tons	ounces	ounces	oz. per ton	oz. per ton
Surface stockpile	2,776	9,594	536.9	2,184.5	0.193	0.228
Levels Nos. 0-10	7,123	65	900.5	13.2	0.126	0.204
Levels Nos. 10-20	26,250	42,567	6,673.4	10,284.7	0.254	0.241
Levels Nos. 20-30	60,949	77,299	7,617.5	7,802.5	0.125	0.101
Levels Nos. 30-40	31,402	29,630	9,533.9	8,770.8	0.304	0.296
Levels Nos. 40-50						
Total	128,500	159,155	25,262.2	29,055.7	0.196	0.183

Branch veins produced 8.7 percent of the tonnage milled, containing 22.6 percent of the gold content compared with 6.7 percent and 16.0 percent, respectively, the previous year. The reduction in tonnage from levels Nos. 10-30 is largely due to the gradual exhaustion of slough in outlying areas, where extraction is permissible at this time. Ore is being mined from various stopes, pillars, and remnants between No. 8 and No. 40 levels. Shrinkage stoping has been started on oreshoots recently developed on No. 20 and No. 22 levels. The promising K vein is being readied for stoping above No. 32 level. The U vein above No. 19 level continues to yield consistently high-grade ore and has been proven to extend well above No. 18 level.

A further reduction in milling rate became necessary owing to declining reserves of low-cost, low-grade slough, resulting in higher costs per ton.

General

The year's bullion production was sold to the Mint at Ottawa at average prices of \$37.09 per ounce for the gold and \$1.09 per ounce for the silver. These compare with corresponding prices of \$35.06 and \$0.92 the previous year, and represent a substantial addition to earnings. Wage rates were raised another 3 cents per hour, effective 1 December 1961. Labour turnover remained about the same as during the previous year. Suitable mine labour has been scarce this past summer. Extensive alterations were made to the mill water supply, in order to utilize the warmer water pumped from the mine, greatly reducing the danger of freezing in the long tailings line. The usual repairs to mine plant and services were continued.

The average number of employees was 197: 131 underground, and 66 on surface. G. G. Gilchrist was manager.

Thorncliffe Mines Limited

Thorncliffe Mines Limited was incorporated in September 1958, with an authorized capitalization of 2,000,000 shares of \$1.00 par value, later increased to 3,000,000 shares of no par value, of which 2,600,000 shares have been issued. The directors and officers were: J. H. Thompson, president and director; George Schaefer, vice-president and director; W. C. Rauch, director; R. W. Davies, secretary; C. E. Upton, treasurer. The head office and mine address is Box 11, Timmins.

The property comprises twenty-four claims in Garrison township, District of Cochrane, leased from Buffonta Mines Limited.

The open pit, and newly completed 150-ton mill did not operate after 31 December 1961, owing to the severe winter conditions as well as to a major breakdown in the diesel-electric plant. In April 1962, the mill was dismantled, and along with all equipment was removed from the property, which has reverted to the original owner, Buffonta Mines Limited. A watchman is being kept on at the property.

C. W. Miller was manager, and 2 men were employed during the period of operation.

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Upper Canada Mines Limited

Upper Canada Mines Limited was incorporated in April 1929, with an authorized capitalization of 3,500,000 shares of \$1 par value, of which 3,499,827 shares have been issued. The directors and officers were: J. A. W. Brown, chairman of the board and director; T. J. Day, president and director; J. W. McBean, vice-president and managing director; J. H. Botsford, director and general manager; K. H. Larkin, secretary-treasurer and director; E. T. Donaldson and J. A. Dickson, directors. The head office is at 250 University Avenue, Toronto. The mine address is Dobie.

The company's property comprising fifty-one claims is located in Gauthier township, Kirkland Lake area, District of Timiskaming.

Mining and milling continued throughout 1962.

SHAFTS, UPPER CANADA MINE

	Claim No.	Inclination	Number of Compartments	Depth from Surface
				feet
No. 1 shaft.....	L.6314	Vertical	3 to 1,750-foot level 4 from 1,750- to 3,625-foot level 3 from 3,625 to bottom	5,289
No. 2 shaft.....	L.6321	Vertical	3	1,877

The No. 1 shaft was sunk 324 feet in 1962 to a total depth of 5,289 feet below the collar. The 5,100- and 5,250-foot levels were established.

During the year, 6,510 feet of drifting, 628 feet of crosscutting, and 2,055 feet of raising was completed. Total development footage to 31 December 1962 was as follows: 138,629 feet of drifts; 32,955 feet of crosscuts; 36,562 feet of raises. Some 319 diamond-drillholes, totalling 39,310 feet, were drilled from underground and 5 holes, totalling 5,671 feet, from surface. A fire pump (Peerless 5ABF, 10½, 1,000-gpm. at 100 psi.) was installed in the surface pumphouse.

The following is taken from the company annual report for the year ending 31 December 1962:

Operating Costs and Profits

The net profit at \$351,831.13 is up \$128,545.83 over the previous year. Higher operating costs were offset by a greater number of ounces produced, lower write-offs, and an increase in the price received per ounce of gold from \$35.538 to \$37.426.

Cost per ounce of gold produced before depreciation, taxes, etc., was \$33.533. Operating costs per ton milled over the last four years are tabulated below:

	1962	1961	1960	1959
Mine exploration and development.....	\$1.74	\$1.69	\$1.41	\$1.53
Mining.....	5.53	5.13	4.71	5.02
Milling.....	1.47	1.43	1.25	1.26
General expense.....	1.11	1.07	0.96	0.99
Total.....	\$9.85	\$9.32	\$8.33	\$8.80

The trend to higher mining costs continued as a greater percentage of ore was produced from deeper levels, with increased costs for hoisting, materials handling, and ground support.

Exploration and Development

Drilling on the downward extension of the north zone as far as the 2,750-foot level has shown a persistent zone of scattered values, which is being followed to deeper levels.

Exploration drives on the 3,475- and 4,525-foot levels are being driven east and west to explore the extensions of the L zone along the strike. Two orebodies of medium grade, totalling 110 feet, have so far been developed on No. 3,475 west drive.

This year the greater part of the main L zone development was on the levels from 3,775 to 4,800 feet. The development drifting on the main L zone will soon be completed. However, there remains considerable exploration work to be done above the 4,800-foot level on possible parallel veins and the extension of the L zone.

Shaft sinking to open a new block of levels is now under way. The shaft is being deepened 900 feet to provide six new levels to the 5,700-foot horizon.

Milling

The mill averaged 561.8 tons per day, and operated 98.9 percent of total possible running time. Heads were \$11.26, tails \$0.81 with a recovery of 92.78 percent.

Outside Exploration

It was decided to concentrate outside exploration for gold this year in the area between the company's properties in Gauthier township and the Kirkland Lake camp. The company's holdings in this area have been substantially increased by staking and purchase, a total of 83 claims having been acquired. Among the groups of claims in Gauthier and Lebel townships were 34 claims adjoining the former Pawnee-Kirkland claims. This property, which consists of four patented claims with a gold showing and a shaft to 750 feet, is now owned by the company. Diamond-drilling for assessment purposes on these new claims of the Pawnee group intersected a wide zone of low values.

General

A sprinkler system installed in the principal mine, mill, and office buildings at the No. 1 shaft site will reduce fire insurance charges by over \$14,500.00 per year.

Ventilation of the lower levels was greatly improved by the installation on the 3,475-foot level of the fan formerly used on surface.

The average number of employees was 279: 177 underground, and 102 on surface. J. H. Botsford was general manager.

Wright-Hargreaves Mines Limited

Wright-Hargreaves Mines Limited was incorporated in June 1916, with an authorized capitalization of 5,500,000 shares of \$1 par value, which were reduced to a par value of 40 cents in 1960; all shares have been issued. The directors and officers were: R. C. Stanley Jr., president and director; J. G. Boeckh, executive vice-president, treasurer, and director; J. C. L. Allen, S. J. Bird, P. K. Hanley, and N. O. Seagram, directors; Miss B. A. Argo, secretary. The head office is at 199 Bay Street, Toronto 1. The mine address is Kirkland Lake.

The company's main property, comprising four claims, is in Teck township, Kirkland Lake area, District of Timiskaming.

Mining operations continued throughout 1962.

SHAFTS, WRIGHT-HARGREAVES MINE

	Claim No.	Inclination	Number of Compartments	Total Depth from Surface
No. 1 shaft (ventilation)	L.1829	Vertical	{ 2 to 2,000 ft. 3 to bottom }	feet 2,285
No. 2 shaft (sand pass)	L.1830	Vertical	2	319
No. 3 shaft	L.1829	Vertical	{ 3 to 1,200 ft. 4 to bottom }	4,089
No. 4 shaft	L.1829	Vertical	3	4,000
No. 5 winze (below 3,600-foot level)	—	Vertical	{ 4 to 6,450 ft. 3 to bottom }	7,272
No. 6 winze (below 7,200-foot level)	—	Vertical	2	8,222

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During the year a total of 271 feet of drifting and 1,261 feet of raising was completed. Total development footage to 31 December 1962 was as follows: 257,380 feet of drifts; 91,912 feet of crosscuts; 80,626 feet of raises. Some 12 diamond-drillholes, totalling 2,886 feet were drilled from underground.

The following is taken from the company annual report for the year ending 31 December 1962:

Mining

Mining was conducted on 38 of the 51 main levels down to 7,200-foot level, and on all 6 of the levels served by No. 6 winze below the 7,200-foot level.

Of the total ore milled, 37,509 tons or 25.1 percent of the total (19.5 percent in 1961) was obtained from mining and a minor amount of development work on the six bottom levels.

The average gold content of ore milled in the year was 0.3604 ounces per ton, compared to 0.385 in 1961 and 0.394 in 1960. The gradually declining grade of production is the result partly of greater dilution in the lower levels of the mine, where rock pressures are higher, and also because of continuing clean-up mining in low-grade remnants and tail ends of oreshoots.

The broken-ore reserve was reduced by 6,085 tons to a total of 31,863 tons at the end of the year.

The following table shows the origin of ore hoisted in 1962:

	From Stopes	From Development	Hoisting Stages
	tons	tons	
Surface to 3,900-foot level.....	66,798	1,975	1
4,050-foot level to 7,200-foot level.....	42,462	640	2
7,350-foot level to 8,100-foot level.....	37,110	399	3
Total.....	146,370	3,014	—

Milling

As in the past several years, Wright-Hargreaves ore continued to be treated in Lake Shore mill under the joint milling agreement.

Average daily milling rate was 409.3 tons, compared to 435.8 in 1961 and 450.8 in 1960.

Mill recovery of gold was 96.1 percent of the contained metal, the same as in 1961.

	1962	1961
Milled..... tons	149,384	159,078
Gold recovered..... ounces	51,720.149	58,890.632

Operating Costs

Distribution	1962		1961	
	Cost per ton milled	Cost per ounce gold recovered	Cost per ton milled	Cost per ounce gold recovered
Mine development.....	\$ 0.32	\$ 0.92	\$ 0.57	\$ 1.54
Mining.....	8.03	23.19	8.01	21.65
Milling.....	1.83	5.28	1.92	5.18
Marketing expense.....	0.10	0.30	0.10	0.28
General expense at property.....	1.78	5.15	1.64	4.43
Mine office and supervision.....	0.75	2.18	0.76	2.04
Administration and corporation expense.....	0.52	1.49	0.50	1.35
Mining taxes.....	0.15	0.43	0.14	0.38
Total Operating Expense.....	\$13.48	\$38.94	\$13.64	\$36.85

Ore Reserves

After milling 149,384 tons of ore in the year, the developed available unbroken and broken reserve was reduced by 80,615 tons to a total on 1 January 1963 of 139,463 tons estimated to contain 0.36 ounces of gold per ton.

The ore reserve has been carefully reviewed, and the reduction in grade from the value reported at the end of 1961 reflects a higher dilution factor and, in part, a revaluation of some ore blocks in the light of mining experience.

New ore developed by drifting and raising amounted only to 2,970 tons, and other ore added to the reserve was won by mining beyond previously established ore limits.

The average number of employees was 353; 253 underground, and 100 on surface. Frank Buckle was general manager.

IRON ORE AND IRON

Shipments of ore in 1962 were greater than those of 1961 by 11.12 percent in quantity and 3.41 percent in value. Seventy-five percent of the ore was shipped to plants in the United States.

The industry paid \$3,048,611 to 349 salaried employees and \$10,226,805 to 1,867 wage-earners. Fuel and electricity cost \$3,120,036, and process supplies cost \$4,305,381.

The Algoma Steel Corporation Limited

In October 1960, Algoma Ore Properties Limited, Algoma Steel Corporation Limited, and Canadian Furnace Company Limited, were amalgamated under the name of The Algoma Steel Corporation Limited. The authorized capitalization is 15,099,880 shares of no par value, of which 5,786,192 shares have been issued. The directors and officers were: D. S. Holbrook, president, chairman, and director; E. G. McMillan, vice-president and director; J. B. Barber, vice-president (finance) and director; G. C. Bateman, Hon. T. A. Crerar, Sir Philip Dunn, H. S. Hamilton, W. H. Howard, G. W. Humphrey, T. R. McLagan, J. S. D. Tory, and Wilhelm Zangen, directors; R. Armstrong, vice-president (industrial and public relations); Douglas Joyce, vice-president (operations); C. C. Weeks, vice-president (sales); D. A. Machum, secretary; C. E. McLurg, treasurer. The head office is at 503 Queen Street East, Sault Ste. Marie.

ALGOMA ORE PROPERTIES DIVISION

Algoma Ore Properties Division holds various iron properties in the District of Algoma, including the Helen mine, the George W. MacLeod mine, and the Sir James mine, three miles east of the Helen, and the Goudreau Pyrite property. The mines (excluding the Goudreau Pyrite property) and the sintering plant, are at Wawa.

**HELEN MINE
(Helen, Victoria and Alexander Orebodies)**

The property comprises eighty-six claims in ranges 23 and 24, Township 29, District of Algoma. Mining operations continued from 1 January to 1 October 1962. Production facilities of the Helen mine area were supplanted by those at the George W. MacLeod mine.

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SHAFTS, HELEN MINE

	Claim No.	Inclination	Number of Compartments	Total Depth from Surface
No. 1 shaft (inactive).....	R.737	Vertical	3	feet 428
No. 2 shaft (inactive).....	R.737	60°	3	375
No. 2 shaft (inactive).....	R.737	Vertical	3	682
No. 3 shaft.....	D.J.22	Vertical	3	921

No drifting, crosscutting, or raising was completed in 1962. Total development footage to 31 December 1962 is shown in the following table:

	Drifts		Crosscuts		Raises	
	1962	Total	1962	Total	1962	Total
First level.....	—	feet 22,030	—	feet 3,254	—	feet 15,706
Subdrifts.....	—	28,565	—	1,185	—	—
Second level.....	—	15,443	—	6,353	—	23,602
Subdrifts.....	—	27,526	—	1,330	—	—
Third level.....	—	3,875	—	718	—	661
Total.....	—	97,439	—	12,840	—	39,969

A total of 134,922 tons of ore was hoisted during the period of operation.

GEORGE W. MacLEOD MINE

This property consists of fourteen claims in ranges 23 and 24, Township 29, District of Algoma. Mining operations continued from 1 January to 4 November, and from 26 November to 31 December 1962.

SHAFTS, GEORGE W. MACLEOD MINE

	Claim No.	Inclination	Number of Compartments	Total Depth from Surface
No. 4 shaft (below 2nd level).....	D.J.22	Vertical	2	feet 1,778
No. 5 shaft.....	D.J.24	Vertical	3	2,066
Ropeway.....	D.J.24, 25, 30, 31	—22°	1	1,827

During 1962, a total of 11,538 feet of drifting, 4,196 feet of crosscutting, and 5,522 feet of raising was completed. Total development footage to 31 December 1962 was as follows: 65,643 feet of drifts; 20,218 feet of crosscuts; 27,435 feet of raises.

New construction in the mine area including a mine repair shop building, a steel water tank, and an administration building commenced in 1961, was completed in 1962. New construction in the sinter plant area included: completion of the extension to the main warehouse, a screening plant (80 x 60 ft.), a mixing-station building (46 x 36 ft.), a conveyor system screening plant, all steel and sheet metal (Galbestos) construction.

New equipment added in the locations indicated was as follows:

- A mixing drum and a cooling drum (Allis-Chalmers).
- 3 vibrating feeders (Syntron).
- 2 hot sinter screens (Hewitt Robins).
- 1 feeder (Ross).
- 1 sinter breaker (McKee).
- 1 classifier.
- 3 dust collectors (1 Americlone, 1 wet cyclone, 1 cyclone).
- 1 trackmobile (Whiting).
- A complete conveyor system in the sinter plant.
- A bucket elevator and pump (8-in., 400-gpm.) in the ore-preparation plant.
- Exhaust ventilation fan in the garage.
- Isolette in the hospital.
- Filter (Rabson, capacity 30,000 cfm.), at the haulage dump.
- Dust collector (Wheelabrator-Dustube No. 6, 126D, capacity 13,000 cfm.), at crusher.
- Trolley locomotive (221-36-100T, 2-motor, 32-ton, Goodman).
- 10 mine cars (Malmberget drop-bottom, capacity 250 cu. ft.).
- Haulage dump for above cars (Robert Hudson, England).
- Silicon rectifier (diode, 100-kw., Canadian General Electric).
- 2,000 feet of track trolley wire and associated control equipment on surface.

A total of 1,551,274 tons of ore was hoisted and conveyed.

SIR JAMES MINE

This property consists of two claims and two mining locations in range 24, Township 29, District of Algoma. The Sir James mine commenced production of ore in 1958. A spur railway line was built from the Helen mine to provide service to the operation and for the transportation of ore to the treatment plant. A conveyor tunnel, 610 feet long, was driven at an angle of 14.5 degrees to house the conveyor carrying ore from the underground crusher to the railway loading point. The crusher-room was cut at a point 124 feet vertically below surface.

Mining operations continued from 1 January to 4 November, and from 27 November to 31 December 1962.

A total of 609,854 tons of ore was hoisted and conveyed.

GOUDREAU PYRITE

The property consists of ten claims, located in Township 27, range 26, in the Sault Ste. Marie mining division and includes the Rand No. 1 and Bear A and C groups of claims. Mining operations in the open pit continued throughout 1962.

The pyrite is used primarily as fuel in the sintering process.

Some 43 diamond-drillholes, totalling 4,918 feet, were completed from surface.

A total of 151,621 tons of pyrite was mined.

The total ore production from the Helen, George W. MacLeod, Sir James mines, and the Goudreau Pyrite property was 2,447,671 tons.

The average number of employees at the mines was 782: 376 underground, and 406 on surface. C. M. Beck was general manager; J. E. Worley was mine manager.

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ALGOMA STEEL CORPORATION DIVISION

The blast furnace section of the corporation is located at Sault Ste. Marie. Operations continued throughout 1962. No. 1 blast furnace has been dismantled; No. 2 furnace was idle.

PRODUCTION OF IRON, ALGOMA STEEL CORPORATION DIVISION

Furnace	1961		1962	
	Operated	Production	Operated	Production
	days	tons	days	tons
No. 3.....	246	172,216	315	225,503
No. 4.....	228	120,576	363	203,714
No. 5.....	365	664,219	364	684,079
No. 6.....	363	617,413	312	545,979
Total.....	—	1,574,424	—	1,659,275

The sintering plant of the corporation, located at Wawa, operated a total of 355 days during 1962, producing 627,600 tons of sinter.

The average number of employees in the blast furnace section and sintering plant was 694. W. P. Dowhaniuk was superintendent.

CANADIAN FURNACE DIVISION

The Canadian Furnace Division, comprising a blast furnace and the accessory equipment necessary to produce pig iron, is located at Port Colborne.

The blast furnace was operated a total of 193 days during 1962 and produced 111,302 tons of pig iron.

The average number of employees was 116. Thomas Cordner was general superintendent.

The following is taken from the corporation annual report for the year ending 31 December 1962:

Pig iron sales were lower than in 1961; and there was no improvement in the Canadian pig iron market.

The iron ore market continued to be unfavourable due to the low operating rate of the United States steel producers, and sales of Algoma sinter again declined. Increased usage in Algoma's blast furnaces partially offset the reduction in sales to customers in the United States, as the quantity of Algoma sinter used per ton of basic iron produced in the steelworks increased 10 percent over 1961.

Prices of steel products and pig iron were not changed, and prices were lower for coal chemicals. The price of Algoma sinter was reduced 80 cents a gross ton, effective 1 April, in line with a decrease in the price of all Lake Superior iron ores except pellets.

The second large blast furnace was equipped for coke-oven gas injection. This furnace was also relined and equipped with a venturi throat washer to permit modified gas pressures and provide cleaner gas from the furnace. Uniform-size algoma sinter is now available on a production basis from the new screening plant at the Algoma Ore Properties sinter plant at Michipicoten. Use of this sized sinter and coke-oven gas injection on Nos. 5 and 6 blast furnaces will increase iron production, and provide a large proportion of the additional iron required for steelmaking when the third L-D Oxygen Steel vessel is installed.

Production of Algoma sinter at the Algoma Ore Properties Division was reduced in the last quarter of 1962 to avoid an inventory build-up and was discontinued completely for twenty days in November to permit construction of the sinter screening plant. Production was 10½ percent lower than in 1961, decreasing from 1,631,000 gross tons in that year to 1,460,000 gross tons.

Approximately 26 percent of the raw ore sintered came from the Sir James open-pit mine, compared to 46 percent in 1961; and 74 percent from the George W. MacLeod and Helen underground mines, compared to 54 percent in 1961.

The Helen underground mine was mined out, and reserves of ore are now estimated to be:

District	Assured ⁽¹⁾	Millions of Gross Tons		Total
		Indicated ⁽²⁾	Probable ⁽³⁾	
Michipicoten.....	132	59	150	341
Goulais River.....	70	51	29	150
Calabogie.....	30	9	6	45
Total.....	232	119	185	536

⁽¹⁾Assured—closely drilled or partially developed in producing mines.
⁽²⁾Indicated—fewer holes at wider-spaced intervals.
⁽³⁾Probable—few very deep holes and geological information.

Diamond-drilling, sampling, and metallurgical testing of low-grade magnetite iron deposits north of Sault Ste. Marie continued in 1962.

Algoma is working closely with the Canadian Institute of Steel Construction in specifications and research with the objective of stimulating the use of steel in construction.

During 1962, Algoma, three other Canadian steel producers, and eighteen United States steel companies joined in a unique venture known as Blast Furnace Research Inc. This organization will co-operate with the United States Bureau of Mines in a two-year investigation of blast furnace technology using an experimental furnace constructed at Bruceton, Pa., U.S.A. Tests will be made on important factors such as premixed burdens, sized ore, injections of various materials, and the effects of coke quality. Such research would be beyond the means of many of the individual companies.

Anaconda Iron Ore (Ontario) Limited

Anaconda Iron Ore (Ontario) Limited was incorporated in November 1957, with an authorized capitalization of 5,000,000 shares of \$3 par value, of which 3,000,000 shares have been issued. The directors and officers were: J. B. Knaebel, president and managing director; J. S. Vanderploeg, Mord Lewis, and J. J. Gourd, vice-presidents and directors; W. T. Swensen, assistant vice-president and director; A. R. McGinn, secretary-treasurer and director; P. E. Riverin, J. Monette, R. S. Newlin, and C. J. Parkinson, directors. The head office is at Eighth Street, New Toronto. The executive office and mine address is 105 North Cumberland Street, Port Arthur.

The property consists of 472 claims in the Kowkash Mining Division, about 40 miles north of Nakina. Surface exploration, geophysical work, and diamond-drilling have indicated large tonnages of low-grade, open-pit, concentrating ore. During 1959 a road was completed from Cavel to the property, and to the Nakina-Geraldton road.

In 1962 a small crew did maintenance work at the company's property. The crew was reduced to a minimum in September.

The average number of employees on surface was 41. J. Barlow was foreman in charge at the property.

Caland Ore Company Limited

Caland Ore Company Limited was incorporated in November 1957, with an authorized capitalization of 100,000 shares of \$50 par value, all of which have been issued. It is a wholly-owned subsidiary of Inland Steel Company of Chicago. The directors and officers were: P. D. Block Jr., chairman and director; C. B. Jacobs, president and director; R. D. Satterley and H. M. Graff, vice-presidents and directors; J. L. Block, L. B. Hunter, J. F. Smith Jr., F. G. Jaicks, and R. L.

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Peters, directors; P. P. Ribotto, vice-president; W. B. Cummings, treasurer and assistant secretary; J. C. Carter, secretary; W. H. Lowe, assistant treasurer and assistant secretary. The head office is at 30 West Monroe Street, Chicago 3, Illinois, U.S.A. The mine address is Atikokan.

The property consists of forty-eight claims in Schwenger and Freeborn townships, District of Rainy River, and includes thirty-one claims held on a 99-year lease from Steep Rock Iron Mines Limited. The lease covers a section of the C orebody at the east end of Steep Rock Lake.

Operations continued throughout 1962.

The Falls Point mine is serviced by the vertical, eight-compartment shaft, 1,333 feet deep, located on claim F.F. 3513.

All underground work was suspended in December 1961. The total development footage at that time was as follows: 205 feet of drifts; 5,171 feet of crosscuts; 976 feet of raises; on the 800, 1,000, and 1,200-foot levels. Some 16 diamond-drillholes, totalling 5,669 feet, were drilled from surface in 1962.

Major equipment added in 1962 consisted of a 50-ton truck crane (Bucyrus-Erie, Model 30-B).

All production in 1962 was from the open pit and consisted of 2,003,472 tons of iron ore. Part of the open-pit ore was dumped into an ore-pass and hoisted in the shaft.

The average number of employees was 224; 69 in the open pit, and 155 on surface. P. P. Ribotto, vice-president, was in charge at the property.

Can-Fer Mines Limited

Can-Fer Mines Limited was incorporated in August 1957, with an authorized capitalization of 6,000,000 shares of \$1 par value, of which 2,665,005 shares had been issued as of April 1961. The directors and officers were: H. L. Isaacs, president and director; W. M. Gordon, secretary and director; J. L. Kemmerer Jr., P. Porzelt, C. B. Schubert, and A. S. Miller, directors; G. T. Smith, treasurer. The head office is at 18 Toronto Street, Toronto 1. The mine address is Kowkash.

The property consists of about 300 claims in Paska, Kowkash, Oboshkegan, and Gzowski townships, District of Thunder Bay, about six miles south of Kowkash on the Canadian National railway.

The company reported that extensive metallurgical testing had been completed by May 1962 and negotiations for production are pending.

The average number of employees was two. Dr. B. K. Meikle was in charge at the property.

Dominion Foundries and Steel Limited

Dominion Foundries and Steel Limited was incorporated in May 1917. The authorized capitalization was 5,000,000 shares of no par value, of which 3,808,118 shares have been issued. The officers were: F. A. Sherman, chairman; A. G. Wright and F. A. Loosley, vice-chairmen; F. H. Sherman, president and general manager; D. F. Hassel, vice-president; R. R. Craig, vice-president (sales); D. O. Davis, vice-president (engineering); D. A. Lindsey, vice-president (purchases); J. G. Sheppard, secretary and comptroller. The head office and plant address is Hamilton, P.O. Box 460.

PRODUCTION OF IRON, DOMINION FOUNDRIES AND STEEL LIMITED

Furnace	1962		1961	
	Operated	Production	Operated	Production
No. 1	days 224	tons 301,964	days 365	tons 434,011
No. 2	151	197,871	365	550,155
No. 3	365	617,794	365	984,166
Total	—	1,117,629	—	984,166

Operations continued throughout 1962.

No. 3 blast furnace was on blast throughout 1962. No. 2 furnace was taken off blast at the beginning of June for relining and was replaced then by No. 1 furnace, which had been completely relined and equipped with oil injection for another iron-making campaign. The highest production record was attained during the year; this was attributed to the increased use of higher-grade pellets and lump or screened ore in conjunction with high-top pressure, the heavy-fuel injection system, and additional wind through the stoves to the furnaces, which is a requisite for the efficient flow control of oil.

A pilot, fluid-bed briquetting operation was instituted in 1962. Flue dust, sludge from the thickener, mill scale, and slag fines from the oxygen furnace are heated in a reactor to about 1,800°F, then pressed into briquettes. The objective is to efficiently treat stockpiled or discarded material for subsequent blast-furnace burden without resorting to a sinter plant with its comparatively high capital investment. Also, it may offset the manganese deficiency in the iron ore pellets by processing slag fines from the oxygen furnace for the manganese content, thus alleviating the need of premium material or screened ore containing manganese.

The average number of employees in the blast furnace division was 169. H. C. Taylor was superintendent; Lloyd Thomas was assistant superintendent.

Jones and Laughlin Steel Corporation

Jones and Laughlin Steel Corporation was incorporated in December 1922, with an authorized capitalization of 293,568 preferred shares of \$100.00 par value and 10,000,000 common shares of \$10.00 par value; all preferred shares and 7,885,472 common shares have been issued. The officers of the company were: A. C. Adams, chairman of the board; C. M. Beeghly, president; W. J. Stephens, executive vice-president; H. H. Wunderlich, vice-president and treasurer; H. J. Houghton, vice-president and controller; A. A. Archibald, F. T. Barton, G. E. Flaccus Jr., Herbert Johnson, A. T. Lawson, J. W. Lindsey, H. P. Sharp, P. L. Tietjen, J. E. Timberlake, and H. S. Turner, vice-presidents; W. R. Compton, secretary. The head office is at 3 Gateway Center, Pittsburgh 30, Penn., U.S.A. The address of the Adams mine is Box 547, Kirkland Lake.

The property, known as the Adams mine, comprises 139 claims in Boston township, District of Timiskaming. It is about 6 miles southeast of Kirkland Lake; the distance by road is about 15 miles. The ore is a banded magnetic iron formation containing an average of 25 percent iron. It will be mined in open pits, crushed, ground, and concentrated magnetically. The concentrate will be pelletized and loaded in railroad cars for direct year-round shipment to Jones and Laughlin plants. Production is scheduled for 1964.

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The Ontario Northland Railway, in 1962, completed a six-mile spur line to the mine from its main line at Boston Creek. An access road to the property was constructed. C. A. Pitts Construction Company have completed the stripping of the central pit. This entailed the moving of 571, 800 cubic yards of overburden and 245,600 cubic yards of waste rock. Construction of a truck-storage garage, office, shop, and warehouse building was in progress. Construction of the mining plant had not yet started.

Some 24 diamond-drillholes, totalling 16,497 feet, were completed from surface.

Construction workers for C. A. Pitts ranged from 125 to 325 during 1962. R. W. Braund was manager; R. E. Durocher was superintendent of the Northern Ontario Ore Division of the company, which employed an additional 12 men.

Lowphos Ore Limited (Moose Mountain Mine)

Lowphos Ore Limited, incorporated in July 1941, is a subsidiary of National Steel Corporation and operates under the direction of Hanna Iron Ore Division of the corporation. The directors and officers were: W. A. Marting, president and director; R. W. Whitney, R. H. Bartholomew, and E. S. Mollard, vice-presidents and directors; G. W. Humphrey, director; S. L. Engel, secretary; R. E. Beal, treasurer; F. W. Bennett, assistant secretary; F. C. Teske, assistant treasurer. The head office is at 1300 Leader Building, Cleveland 14, Ohio, U.S.A. The mine address is Capreol.

Lowphos Ore Limited has a lease on the Moose Mountain iron property, approximately 5,424 acres, about 35 miles north of Sudbury, in Hutton township, District of Sudbury. The iron ore concentrate is shipped by rail from the property to Depot Harbour, District of Parry Sound, where it is transferred to cargo ships.

The open pit and mill operated throughout 1962.

Some 39 diamond-drillholes, totalling 10,774 feet were drilled from surface. Construction of a pelletizing plant, 197 by 88 feet, began in September 1962, with estimated completion by September 1963.

A total of 1,364,392 tons of ore was mined in the open pit; 1,455,000 tons was milled at an average of 4,000 tons per day.

The average number of employees was 189: 68 in the open pit, and 121 on surface. F. F. Rahne was superintendent.

Marmoraton Mining Company Limited

Marmoraton Mining Company Limited is a wholly-owned subsidiary of Bethlehem Steel Corporation. It was incorporated in the State of Delaware in November 1950. The authorized capitalization is 205,000 shares of \$100 each, of which 200,500 have been issued. The directors and officers were: P. B. Entekin, president and director; W. H. Johnstone, vice-president and director; F. R. Brugler, comptroller and director; B. D. Broeker, secretary and director; I. D. Sims, director; H. O. Olsen, vice-president and general superintendent; P. S. Killian, A. M. Rupkey, S. J. Shale, and E. P. Leach, vice-presidents; J. Bernhardt, manager; E. W. Morris, treasurer. The head office and mine offices are at Marmorata. The executive office is at Wilmington, Delaware, U.S.A.

The company owns an iron property in Marmora and Rawdon townships, County of Hastings, a short distance east of Marmora.

Full-scale production of 1,700 tons of iron pellets per days was realized throughout the past year except for a holiday shut-down of two weeks in July. The pelletized ore was shipped via railroad and water from the company's ore dock at Picton to their steel plant at Lackawanna, N.Y., U.S.A.

Most of the ore was mined from the 440- and 395-foot levels, and a new cut was established at the 340-foot level; this is a 55-foot bench. The upper portion of the pit was mined in 45-foot benches in the ore below the limestone capping. The bottom of the pit is now 304 feet below datum.

A Michigan front-end angle dozer (Clark Equipment Co.) and a used electric shovel (capacity 6 cu. yards, Marion Shovel Co.) was added equipment in 1962.

A total of 1,262, 539 tons was mined in the open pit, from which 328,075 tons was discarded. The mill treated 934,464 tons of ore, averaging 2,710 tons daily, and produced 486,740 tons of pellets.

The average number of employees was 295: 97 in the open pit, and 198 on surface. H. O. Olsen, vice-president and general superintendent was in charge.

Oglebay Norton Company (Canadian Charleston Mine)

Canadian Charleston Limited was incorporated in April 1955. In 1962 the name was changed to Oglebay Norton Company, Canadian Charleston Mine. The authorized capitalization is 3,000,000 shares of \$1 par value, of which 1,019,951 shares have been issued. The officers were: E. W. Sloan, Jr., president; J. J. Dwyer, secretary; F. R. White, Jr., treasurer. The head office is at 1200 Hanna Building (P.O. Box 6508), Cleveland 1, Ohio, U.S.A. The mine address is Box 1510, Atikokan.

The company holds a lease on about 1,000 acres in Freeborn and Schwenger townships, Steeprock Lake area, District of Rainy River. The property, which includes the Mathieu and Pattison groups of claims, is situated between Atikokan and the Steep Rock Iron mine.

The open pit and concentrator operated from 2 May to 30 September 1962. A total of 1,364,946 tons of crude ore was removed from the open pit; 1,240,860 tons was milled, producing 164,617 tons of concentrate. The concentrator treated 82,724 tons daily during the period of operation.

The average number of employees was 47; C. F. Bauers was manager.

The Steel Company of Canada Limited

The Steel Company of Canada Limited was incorporated in June 1910. The authorized capitalization was increased in 1953, and in 1962 to 28,000,000 shares of no par value, of which 20,245,576 shares have been issued. The directors and officers were: H. G. Hilton, chairman and chief executive officer; V. W. T. Scully, president and director; L. T. Craig and H. M. Griffith, vice-presidents and directors; Allan Graydon, G. A. R. Hart, Frederick Johnson, R. A. Laidlaw, L. L. Lang, J. R. Gordon, H. Greville Smith, D. R. McMaster, and H. G. Welsford, directors; R. B. Taylor, vice-president and treasurer; N. J. Brown, vice-president and comptroller; H. J. Clawson, vice-president; W. C. Chick, secretary and

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assistant treasurer; J. W. Younger, assistant secretary; B. M. Kinnear, assistant treasurer; R. E. Karr, assistant comptroller. The head office and blast furnace division is at Wilcox Street, Hamilton.

PRODUCTION, THE STEEL COMPANY OF CANADA

Furnace	1962		1961	
	Operated	Pig Iron Produced	Operated	Pig Iron Produced
	days	tons	days	tons
A.....	365	111,928	361	110,909
B.....	364	376,933	298	283,550
C.....	365	482,358	349	434,666
D.....	364	736,377	354	690,805
Total.....	—	1,707,596	—	1,519,930

The sinter plant operated at capacity during 1962. The effect of producing sized sinter, ranging from minus one inch to plus $\frac{1}{4}$ inch, for the blast furnace was explored.

All four blast furnaces produced at capacity throughout the year and achieved a record in the history of the company. The trend to beneficiated materials continued, with emphasis directed towards an evaluation of the raw materials, because optimum blast furnace productivity requires an understanding of the optimum physical and chemical properties of the raw material. The spotlight is at present on coke, determination of its strength, and the reactivity as it reacts in the blast furnace.

Natural-gas injection was introduced at C blast furnace, which is the third furnace here to supplement imported coke as a fuel. In order to permit the efficient use of natural gas while achieving normal tuyère zone temperature and improved economy, plans were finalized to increase the heating area of the stoves, to increase the moisture or humidity of the air, and to increase the hot blast temperature.

The average number of employees was 535. C. M. Birkett was works manager; J. S. McMahan was superintendent, and J. A. Peart assistant superintendent, in the blast furnace division. J. G. Sibakin was manager, research and development.

Steep Rock Iron Mines Limited

Steep Rock Iron Mines Limited was incorporated in February 1939. Early in 1955 the authorized capitalization of 30,000 shares of preferred stock of \$100 par value, and 10,000,000 shares of common stock of \$1 par value, was changed to 10,000 shares of preferred stock of \$100 par value and 10,666,666 shares of common stock of \$1 par value. The 20,000 previously issued shares of preferred stock were converted into 666,666 shares of common. The number of shares issued at 31 December 1962 was: common 8,058,872; preferred, none. The directors and officers were: Cyrus S. Eaton, chairman of the board and director; M. S. Fotheringham, president, general manager, and director; Neil Edmonstone, vice-president, secretary-treasurer, and director; W. R. Daley, J. G. Cross, G. E. Allen, Mark McKee, John Paterson, F. H. Black, D. D. Hogarth, and C. J. Burchell, directors. The head office and mine office are at Steep Rock Lake.

The company holds about 7,000 acres in Freeborn and Schwenger townships, Steep Rock Lake area, District of Rainy River.

Operations continued throughout 1962. The amount of ore mined during the year is shown in the following table:

	Tons
A orebody (Hogarth open pit)	383,207
B orebody (Errington underground)	128,558
G orebody (Roberts open pit)	501,403
	1,013,168

A total of 962,885 tons of ore was shipped.

A (HOGARTH) OREBODY

Open-pit mining was completed on 16 March 1962. Some 383,207 tons of ore was mined. A total of 119,423 cubic yards of stripping had been completed during the period of operation.

Preparations for underground mining of the Hogarth orebody had continued to 31 August 1961.

SHAFTS, A (HOGARTH) OREBODY

Shaft	Claim No.	Inclination	Number of Compartments	Depth from Surface
No. A-1 (inactive)	F.F.3183	Vertical	3	feet 845
No. A-2	F.F.3660	Vertical	4	1,480

Total development footage, when underground operations were discontinued, was as follows: drifts, 1,477 feet; crosscuts, 5,169 feet; raises, 1,040 feet.

B (ERRINGTON) OREBODY

Underground mining on the B (Errington) orebody continued throughout 1962.

SHAFTS, B (ERRINGTON) OREBODY

Shaft	Claim No.	Inclination	Number of Compartments	Depth from Surface
No. B1 Errington (Float Ore Island)	G.629	Vertical	3	feet 1,263
Mosher Point (Drainage Tunnel)	F.F.3664	Vertical	2	283

Development footage in 1962 comprised: 6,002 feet of drifting, 225 feet of crosscutting, and 1,082 feet of raising. Total development footage to 31 December 1962 was as follows: 42,516 feet of drifts; 13,311 feet of crosscuts; 9,077 feet of raises. Diamond-drilling in 1962 consisted of 22 holes, totalling 3,160 feet, from underground. A total of 128,558 tons of ore was hoisted; 21,535 tons of waste was discarded.

ROBERTS OPEN-PIT MINE

The dredging of the G ore zone was completed at the end of 1961. A total of 1,768,448 cubic yards of material was removed from this portion of the G ore zone, which is called the Roberts mine, in 1962. Some 13 diamond-drillholes,

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totalling 5,936 feet, were completed from surface. The material handling system, including foundations, conveyors, and transfer buildings, was completed. A portable lighting plant (6-kva., 110-volt, diesel-driven) was installed.

A total of 501,403 tons of ore was mined in the open pit in 1962.

The following is taken from the company annual report for the year ending 31 December 1962:

Shipment of 2,966,357 tons of iron ore from the Steep Rock Range in 1962 constituted the second highest tonnage in its history. Of this amount, 962,885 tons came from mines operated by the company, while 2,003,472 tons were shipped from the C ore zone under lease to Caland Ore Company Limited, a wholly-owned subsidiary of Inland Steel Company of Chicago.

Market demands to date have been met mainly from open-pit production, and the bulk of the ore shipped in 1962 was from this source. Reserves of open-pit ore are ample for sustained production over the next twenty years. At the same time, intensive studies have been conducted towards devising unique methods to develop the company's vast reserves of underground ore, so that underground mining will be able first to supplement and then to replace open-pit production. During the year, satisfactory progress has been made towards these objectives, and indications are that mechanization of the new methods will permit achievement of production goals on a very attractive economic basis.

Concerted effort has been directed towards further improvement of all cost factors. Current estimates for 1963 contemplate substantial reductions in overhead expenditures, made possible by completion of the development and construction stage of operations, and resultant organizational streamlining.

Capital expenditures for the year were \$2,592,102, of which the new Roberts open-pit conveyor system accounted for \$722,000. This was in marked contrast with 1961, when \$5,507,000 was expended, and with earlier years, when requirements of the dredging program were especially heavy.

Capital expenditures for 1963, including completion of the Roberts pit-conveyor system, are estimated at approximately the same level as 1962.

Exploration

In addition to the regular activities of the exploration department, the company has associated itself with other strong groups in explorations for mineral deposits. No single-handed, large-scale expenditures are anticipated.

The Lake St. Joseph iron ore property, as reported earlier, is a valuable large reserve, capable of producing more than 150,000,000 tons of pelletized ore. Development of this project can proceed promptly when desired, to help fill future requirements of the steel industry in the United States and Canada.

The Future

In keeping with trends of the industry, the company is accelerating studies directed towards producing pellets from its iron ore and development of expanded markets for its product. This program is progressing well, and is expected to result in favourable conclusions in the near future. Meanwhile, through careful quality control and beneficiation of certain ore types, 1962 shipments were the highest grade ever attained at Steep Rock.

The company is confident that the quality, magnitude and location of its ore reserves, their amenability to processing to meet changing market requirements, and the efficiency of its intensive research program will assure continued profitable growth.

The average number of employees was 466: 126 underground, and 340 on surface. M. S. Fotheringham, president and general manager, was in charge of operations at the property. W. S. Bannister is manager (operations).

Strategic-Udy Metallurgy Limited

Strategic-Udy Metallurgical and Chemical Processes Limited, a subsidiary of Strategic Materials Corporation, was incorporated in October 1955. In December 1960, the name was changed to Strategic-Udy Metallurgy Limited. The authorized capitalization was 1,000 shares of no par value, all of which have been issued. The directors and officers were: R. W. Vollmer, president and director;

R. O. Denman, vice-president and director; M. C. Udy, J. C. Udd, and G. C. Monture, vice-presidents and directors; E. H. Damon, secretary; W. H. Dalman, treasurer; H. O. Tervo, assistant treasurer; R. D. Howe and R. D. Weldon, assistant secretaries. The head office and plant is at 3527 Stanley Avenue, Niagara Falls.

The plant of Strategic-Udy Metallurgy Limited consists of four separate operational departments:

- 1) A crushing plant capable of handling 50 tons per hour.
- 2) A concentration mill, equipped with wet and dry magnetic separators, capable of handling up to 10 tons of ore per hour. This is considered the largest custom-pilot concentrating plant in Canada.
- 3) A prototype smelting plant equipped with one 5½- by 80-foot rotary kiln, three 1,000-kva smelting furnaces, and one three-ton steel refining furnace.
- 4) A commercial smelting division, consisting of one 8- by 150-foot rotary kiln and one 10,000-kva smelting furnace of the Strategic-Udy design, operated from 1 January to 17 October, 1962, producing 12,000 tons of high carbon ferrochrome alloy. In 1962 a bottom-blow oxygen converter was developed for the refining of high carbon ferrochromium.

The crushing and concentrating plant during the previous year processed 2,200 tons of ore from northern Ontario, preparatory to smelting the magnetic concentrates in the prototype plant.

Previous smelting campaigns produced ferrochromium, pig iron, and semi-steel. During the last quarter of 1962, a high titanium ore was processed to produce a pig iron and a high titanium slag. The slag will be further processed to separate vanadium and titanium.

The average number of employees was 99; W. S. Douglas was general manager.

LEAD AND ZINC

Both these metals showed increases in production from 1961 to 1962. Lead was up 36.94 percent in quantity and 33.01 percent in value. Zinc was up 21.55 percent in quantity and 16.83 percent in value. All the lead and zinc came from the Manitouwadge area. There was no lead recovered in 1962 from the ores of the silver-cobalt mines.

The mines of the Manitouwadge area paid \$777,284 to 148 salaried employees and \$3,364,480 to 648 wage-earners. Fuel and electricity cost \$534,913, and process supplies cost \$1,839,075.

For operations at the mines see NICKEL AND COPPER.

MAGNESIUM AND CALCIUM

These metals are produced in Ontario by Dominion Magnesium Limited. Both showed increases over the 1961 production. Calcium was up 24.31 percent in quantity and 23.32 percent in value, and magnesium was up 15.46 percent in quantity and 11.93 percent in value.

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Dominion Magnesium Limited

Dominion Magnesium Limited was incorporated in February 1941, with an authorized capitalization of 500,000 shares of no par value, of which 476,270 shares have been issued. The directors and officers were: R. J. Jowsey, president and director; C. C. Calvin, vice-president and director; John Thomson, general manager and director; J. G. Weir, L. M. Pidgeon, F. H. Jowsey, G. T. N. Woodrooffe, and J. M. Mortimer, directors; H. B. Clearihue, secretary-treasurer; M. Crabtree, assistant secretary. The head office is at 320 Bay Street, Toronto 1. The plant address is Haley.

Dominion Magnesium Limited holds exclusive patent rights to the Pidgeon magnesium production process. Operations continued throughout 1962 at the company's quarry and plant about 3 miles from Haley, comprising about 383 acres in concessions V and VI, Ross township, Renfrew county.

A white Grenville dolomite is quarried near the plant. This high purity rock contains about 21 percent magnesium carbonate, and 31 percent calcium carbonate. The rock is crushed and calcined prior to mixing with ferrosilicon and a small amount of fluorspar. The fluorspar acts as a catalyst, while the ferrosilicon is the reducing agent for the production of magnesium. Aluminium powder is used as the reducing agent for the production of calcium. The mixtures are briquetted and bagged before being placed in the reduction furnaces. The magnesium or calcium crowns are moved from this section to the melt-plant for further purification. Mixes are also made with other metals, such as aluminium, thorium, zirconium, barium, strontium, and lithium, to make up different alloys.

New equipment added included an Ingersoll-Rand compressor (Model 23, 1,590 cfm.) in the kiln building, and a Roscoe Turner casting machine in the melt-plant.

Production of metals for 1961 and 1962 was as follows:

	1962	1961
	pounds	pounds
Calcium crowns	123,654	165,227
Magnesium, pure metal	15,241,159	14,272,287
Thorium pellets	12,758	34,777
Titanium powder	6,660	9,505
Barium	23	260
Strontium	92	18
Zirconium pellets	23,395	11,312

The following is taken from the company annual report for the year ending 31 December 1962:

The use of natural gas in conjunction with the plant expansion at Haley has improved over-all efficiency. All four newly installed natural-gas-fired furnaces were in operation by 1 March, and one of the ten electrically-heated furnaces was shut down in February for conversion to natural-gas-firing. This conversion was completed in August, and all fourteen furnaces were in operation for the remainder of the year. Magnesium crown production reached a record of 9,526 tons.

The research program was mainly concentrated on new furnace design and increasing the efficiency of the natural-gas-fired furnaces.

The introduction of a new products line of magnesium rods and couplings for the diamond-drilling industry has proved to be encouraging.

World consumption of magnesium increased in 1962; productive capacity also increased in Norway and the United States.

The average number of employees in the plant and quarry was 440. J. Thomson was general manager; D. J. McPhail was plant manager.

NICKEL AND COPPER

The quantity of nickel produced in 1962 decreased 15.10 percent in quantity and 7.18 percent in value from 1961. The quantity of copper produced decreased 10.71 percent in quantity and 4.97 percent in value.

Operators in northwestern Ontario, Timagami, Elliot Lake, and Porcupine produced 98,655,000 pounds valued at \$30,583,000, which was an increase of 26.32 percent in quantity and 34.15 percent in value over their 1961 output.

The nickel-copper industry of Sudbury milled 13,877,000 tons of ore and recovered 332,550,000 pounds of nickel valued at \$273,657,661. Nickel from ores from other areas amounted to approximately 610,000 pounds valued at \$526,000. The recovery of copper from Sudbury ores was 278,980,000 pounds valued at \$85,649,000.

NICKEL AND COPPER MINING AND SMELTING

	1958	1959	1960	1961	1962
	tons	tons	tons	tons	tons
Ore treated.....	11,735,895	16,554,454	19,002,040	18,896,447	15,724,683
Copper in blister produced in Ontario.....	125,895	170,116	186,046	192,624	172,407
Nickel produced in Ontario.....	71,422	110,282	126,243	111,174	91,222
Matte exported.....	93,748	107,131	125,333	136,405	121,901
Nickel content of matte exported.....	55,899	63,682	75,407	85,478	77,227
Copper content of matte exported.....	16,185	18,156	20,226	19,022	16,678

PRECIOUS METALS RECOVERED

	1958	1959	1960	1961	1962
Platinum metals.....oz.	300,458	329,081	483,585	418,278	470,782
\$	14,321,443	16,932,178	28,871,955	24,534,349	28,848,262
Gold.....oz.	47,367	42,509	56,665	58,769	55,922
\$	1,609,530	1,427,027	1,923,777	2,083,948	2,092,042
Silver.....oz.	1,217,510	1,384,223	1,665,314	1,785,643	1,757,848
\$	1,056,920	1,215,071	1,480,631	1,683,147	2,047,893
Total.....\$	16,987,893	19,574,276	32,276,363	28,301,444	32,988,197

Also recovered in the processing of these ores was the entire amount of the province's platinum metals, selenium and tellurium, and 98.76 percent of its cobalt. The table on pages 86 and 87 gives details of the production of metals for the nickel-copper industry.

STATISTICAL SYNOPSIS OF THE NICKEL-COPPER INDUSTRY IN ONTARIO

Year	Number of Producing Companies	Dividends Paid	Number of Plants in Ontario	Salaried Employees		Wage-Earners		Selling Value of Products	
				Number	Salaries	Number	Wages	Kind	Value
1958 ⁽²⁾	3	\$42,425,991	16 mines ⁽¹⁾ 4 smelters 2 refineries	1,003 1,105 347	\$ 6,940,510 7,607,745 2,243,207	9,334 6,153 2,303	35,348,771 21,096,430 7,542,760	Nickel in matte Metallic nickel Nickel oxide and salts Copper in matte Converter copper Gold Silver Platinum metals Selenium and tellurium Cobalt Pyrrhotite Sulphur	\$ 76,338,284 90,601,931 10,108,807 7,526,058 45,890,976 1,609,530 1,056,920 14,321,443 688,589 3,359,984 655,569 622,619
Total		\$42,425,991		2,455	\$16,791,462	17,790	\$63,987,961		\$252,780,710
1959	3	\$48,267,656	16 mines ⁽¹⁾ 4 smelters 2 refineries	975 1,108 374	7,146,760 7,112,238 2,476,620	9,220 6,308 2,538	45,601,540 29,320,254 11,219,286	Nickel in matte Metallic nickel Nickel oxide and salts Copper in matte Converter copper Gold Silver Platinum metals Selenium and tellurium Cobalt Pyrrhotite Sulphur	\$ 85,970,920 138,036,499 15,912,284 9,804,234 82,322,026 1,427,027 1,215,071 16,932,178 724,635 4,451,593 632,140 1,041,857
Total		\$48,267,656		2,457	\$16,735,618	18,066	\$86,141,080		\$358,470,464
1960	3	\$50,158,396	19 mines ⁽¹⁾ 4 smelters 2 refineries	1,093 1,151 409	8,071,601 7,562,771 2,786,892	10,209 6,523 2,710	\$51,784,392 31,341,853 12,512,226	Nickel in matte Metallic nickel Nickel oxide and salts Copper in matte Converter copper Gold Silver Platinum metals	\$101,799,347 153,956,279 22,038,141 11,043,287 91,738,960 1,923,777 1,480,631 28,871,955

Total..				2,653	\$18,421,264	19,442	\$95,638,471	Selenium and tellurium..	1,037,575
								Cobalt.....	5,696,208
								Pyrrhotite.....	762,661
								Sulphur.....	985,717
									\$421,334,538
1961.....	3.....	\$56,430,569	{	1,124	8,454,795	10,473	54,191,874	Nickel in matte.....	\$126,507,279
			{	1,182	7,830,457	6,334	31,302,053	Metallic nickel.....	145,861,044
			{	418	2,950,140	2,613	12,410,680	Nickel oxide and salts..	22,991,719
								Copper in matte.....	9,967,622
								Converter copper.....	89,604,061
								Gold.....	2,083,948
								Silver.....	1,683,147
								Platinum metals.....	24,534,349
								Selenium and tellurium..	1,110,243
								Cobalt.....	4,147,340
								Iron ore.....	3,281,209
								Sulphur.....	833,706
Total..		\$56,430,569		2,724	\$19,235,392	19,420	\$97,904,617		\$432,605,667
								Nickel in matte.....	\$122,084,245
								Metallic nickel.....	134,169,676
								Nickel oxide and salts..	17,955,541
								Copper in matte.....	9,455,058
								Converter copper.....	76,285,695
								Gold.....	2,097,042
								Silver.....	2,047,893
								Platinum metals.....	28,848,262
								Selenium and tellurium..	883,827
								Cobalt.....	4,707,066
								Iron ore.....	4,505,093
								Sulphur.....	952,877
1962.....	4.....	\$70,979,901	{	1,105	\$ 8,573,659	9,904	\$52,125,497		
			{	1,199	8,213,374	5,773	28,209,681	Nickel in matte.....	\$122,084,245
			{	429	3,047,569	2,355	11,223,002	Metallic nickel.....	134,169,676
								Nickel oxide and salts..	17,955,541
								Copper in matte.....	9,455,058
								Converter copper.....	76,285,695
								Gold.....	2,097,042
								Silver.....	2,047,893
								Platinum metals.....	28,848,262
								Selenium and tellurium..	883,827
								Cobalt.....	4,707,066
								Iron ore.....	4,505,093
								Sulphur.....	952,877
Total..		\$70,979,901		2,733	\$19,834,602	18,032	\$91,558,180		\$403,987,275

(1)The figures for "mines" include the following that were active but non-producing:
 1958—Crean Hill (International Nickel), Boundary and Onaping (Falconbridge).
 1959—Crean Hill, Victor (International Nickel), Boundary (Falconbridge).
 1960—Clara Belle, Copper Cliff North, Crean Hill (International Nickel), Boundary, Strathcona (Falconbridge).
 1961—Crean Hill, Copper Cliff North (International Nickel), Strathcona (Falconbridge), and Nickel Mining and Smelting Corporation.
 1962—Copper Cliff North, Crean Hill (International Nickel), Strathcona (Falconbridge).

(2)Only 9 months operation by International Nickel Company of Canada.

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The value of precious metals recovered was \$32,988,000.

The industry paid \$20,380,648 to 2,824 salaried personnel, and \$94,082,050 to 18,520 wage-earners. Fuel and electricity cost \$21,060,811, and process supplies cost \$28,105,296.

Falconbridge Nickel Mines Limited

Falconbridge Nickel Mines Limited was incorporated in August 1928, with an authorized capitalization of 5,000,000 shares of no par value, of which 4,824,110 shares have been issued. The directors and officers were: H. J. Fraser, president and managing director; R. Campbell, executive vice-president and director; C. F. H. Carson, O. D. Cowan, W. F. James, Thayer Lindsley, J. D. Barrington, James Stewart, and R. B. West, directors; R. C. Mott, vice-president (operations); G. S. Jewett, vice-president (sales); G. T. N. Woodroffe, vice-president (finance) and secretary; D. G. C. Menzel, vice-president (corporate affairs); G. P. Mitchell, director of exploration and geology; F. R. Archibald, director of metallurgy and research; A. W. Coome, controller; J. T. McWhirter, treasurer; J. L. Matthews, assistant secretary. The head office is at 7 King Street East, Toronto 1.

The company has numerous interests and holdings, mainly in mining companies, through a merger with Ventures Limited in 1962. The nickel-copper mines, concentrating and smelting operations are in the Sudbury area; there is a research laboratory at Richvale, and a refinery at Kristiansand, Norway.

SHAFTS, FALCONBRIDGE NICKEL COMPANY'S MINES IN THE SUDBURY AREA

	Inclination	Number of Compartments	Sinking in 1962	Total Depth from Surface
			feet	feet
FALCONBRIDGE				
No. 1 shaft	Vertical	3	—	2,848
No. 5 shaft	Vertical	6	—	4,347
No. 7 (winze, below 4,025-foot level) ...	Vertical	3	—	4,323
No. 9 (winze, below 2,625-foot level) ...	Vertical	6	—	6,564
EAST MINE				
East shaft	Vertical	3	—	3,942
MCKIM				
No. 1 shaft	Vertical	3	—	1,421
No. 2 (winze, below 1,000-foot level) ...	Vertical	3	—	2,437
MOUNT NICKEL (inactive)				
Mount nickel shaft	Vertical	3	—	327
HARDY				
Hardy shaft	Vertical	3	—	1,427
No. 1125 (winze, below 1,000-foot level)	36½°	—	—	1,138
BOUNDARY				
Boundary shaft (internal, below Hardy 1,000-foot level)	Vertical	3	—	1,951
ONAPING				
No. 1 shaft	Vertical	5	—	3,148
FECUNIS LAKE				
No. 1 shaft	Vertical	6	—	4,183
No. 2 shaft	Vertical	4	—	3,243
STRATHCONA				
No. 1 shaft	Vertical	4	1,009	3,205

FALCONBRIDGE MINE

The Falconbridge property comprises twenty-four claims in Falconbridge township, District of Sudbury. The mine address is Falconbridge.

Operations continued from 1 January to 31 December 1962.

A total of 11,474 feet of drifting, 909 feet of crosscutting, and 2,665 feet of raising was completed. Total development footage, to 31 December 1962, was as follows: 198,969 feet of drifts; 44,036 feet of crosscuts; 105,153 feet of raises. A total of 377 diamond-drillholes, totalling 37,944 feet, was completed in 1962 from underground.

New construction consisted of an extension to the office building (22 x 58.5 x 20 ft.).

New equipment added was as follows:

- 1 dust collector (bag type, 2,020 sq. ft., 6,000 cfm. at 5 in. w.g. at 2,800-ft. crusher station, Wheelabrator Corp. of Can. Ltd.).
- 1 centrifugal pump (Mather & Platt, 600 gpm. (U.S.) 1,200-ft. head at 1,200-ft. level sump, Mine Equipment Co. Ltd.).
- 1 skip (150-cu. ft., Dorr-Oliver-Long).
- 3 diamond-drills (CD65, Can. Pneumatic Tool Co. Ltd.).
- 1 diamond-drill (BBS 2, Boyle Bros. Drilling Co. Ltd.).

A total of 705,367 tons of ore was hoisted and milled. The average number of employees was 913: 713 underground, and 200 on surface. R. R. Holmes was mine superintendent.

EAST MINE

The property comprises twelve claims in Falconbridge township, District of Sudbury. The mine address is Falconbridge.

Operations progressed from 1 January to 31 December 1962.

During the year 7,593 feet of drifting, 329 feet of crosscutting, and 996 feet of raising was completed. Total development footage, to 31 December 1962, was as follows: 37,884 feet of drifts; 7,008 feet of crosscuts; 14,943 feet of raises. Some 185 diamond-drillholes, totalling 14,844 feet, were drilled from underground in 1962.

New construction consisted of an extension to the dry building (33.5 x 36 x 24 ft. concrete foundation, 8-in. tile walls, Haydite roof).

New equipment added was as follows:

- 2 mine hoist motors (400-hp. with electrical controls, Canadian General Electric Co. Ltd.).
- 5 mine head sheaves (Dodge bicycle type, 96-in. diam., United Steel Corp. Ltd.).

A total of 315,718 tons of ore was hoisted and milled.

The average number of employees was 165: 151 underground, and 14 on surface. M. J. Chesser was mine superintendent.

McKIM MINE

The property comprises twelve claims in McKim township, District of Sudbury. The mine address is Falconbridge.

Operations proceeded from 1 January to July 1962.

There was no development work completed in 1962. The following table gives the total development footage to 31 December 1962:

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UNDERGROUND DEVELOPMENT, MCKIM MINE

Level	Total at 31 December 1962		
	Drifts	Crosscuts	Raises
	feet	feet	feet
300-foot.....	531	600	521
475-foot.....	1,292	519	996
650-foot.....	2,319	671	1,473
825-foot.....	1,121	337	1,215
1,000-foot.....	1,348	746	1,333
1,175-foot.....	1,675	762	906
1,300-foot.....			128
1,350-foot.....	3,098	2,475	1,017
1,450-foot.....	61	496	188
1,550-foot.....	577	540	475
1,675-foot.....	616	420	675
1,800-foot.....	137	572	478
1,950-foot.....	555	1,040	580
2,150-foot.....	157	328	196
2,300-foot.....	53	371	206
Total.....	13,540	9,937	10,387

There was no ore hoisted, and the mine is being closed.

The average number of employees was 23: 13 underground, and 10 on surface. J. A. MacMillan was mine superintendent.

HARDY MINE

The property comprises two claims in Levack township, District of Sudbury. The mine address is Onaping.

Operations progressed from 1 January to 31 December 1962.

During the year, 70 feet of crosscutting was completed.

Total development footage to 31 December 1962, was as follows: 14,893 feet of drifts; 17,952 feet of crosscuts; 12,912 feet of raises. Diamond-drilling in 1962 consisted of 11 holes, totalling 2,045 feet, from underground.

New construction consisted of a Butler building (140 x 40 x 12 ft.) on a concrete foundation.

Equipment added included a mine air heater (oil-fired, 2,500,000 Btu., Calorific Ltd.).

A total of 231,932 tons of ore was hoisted and milled.

The average number of employees was 234: 97 underground, and 137 on surface. J. Bardswich was mine superintendent.

BOUNDARY MINE

The property comprises one claim in Levack township, District of Sudbury. The mine address is Onaping. The Boundary and Onaping mines are, respectively, the upper and lower portions of the same orebody. The Boundary mine has been developed from an internal shaft of the Hardy mine; the Onaping shaft collared on surface is 3,148 feet deep. Ore production from both mines is at a maximum.

Operations progressed from 1 January to 31 December 1962.

During the year, 1,025 feet of drifting, 421 feet of crosscutting, and 522 feet of raising was completed. Total development footage to 31 December 1962 was as follows: 10,560 feet of drifts; 3,079 feet of crosscuts; 1,774 feet of raises. Some 97 diamond-drillholes, totalling 15,649 feet, were completed from underground.

A total of 155,654 tons of ore was hoisted and milled.

The average number of employees was 74, all underground. J. Bardswich was mine superintendent.

ONAPING MINE

The property comprises 1.5 claims in Levack township, District of Sudbury. The mine address is Onaping.

Operations progressed from 1 January to 31 December 1962.

During the year, 115 feet of drifting, 671 feet of crosscutting, and 1,302 feet of raising was completed. Total development footage, to 31 December 1962, was as follows: 7,300 feet of drifts; 8,909 feet of crosscuts; 5,081 feet of raises. Some 172 diamond-drillholes, totalling 23,517 feet, were completed in 1962 from underground.

New equipment added consisted of three Zimmerman supply cars (two 10-ft. long, one 16-ft. long, Dorr-Oliver-Long).

A total of 170,604 tons of ore was hoisted and milled.

The average number of employees was 102: 75 underground, and 27 on surface. J. Bardswich was mine superintendent.

FECUNIS LAKE MINE

The property comprises two claims in Levack township, District of Sudbury. The mine address is Onaping.

Operations progressed from 1 January to 31 December 1962.

During the year, 121 feet of crosscutting and 578 feet of raising was completed. Total development footage, to 31 December 1962, was as follows: 17,155 feet of drifts; 13,544 feet of crosscuts; 12,964 feet of raises. Some 40 diamond-drillholes, totalling 3,185 feet, were drilled from underground in 1962.

New construction consisted of a Butler building (80 x 36 x 12 ft.) and a cooling tower (21 x 17 x 17 ft.), both buildings on concrete foundations.

New underground equipment included two mine pumps (Mather & Platt, centrifugal, 565 U.S. gpm. at 1,760-ft. head), Mine Equipment Co.

A total of 771,452 tons of ore was hoisted and milled.

International Nickel Company of Canada Limited mines the Fecunis ore, and delivers it underground to the Fecunis shaft for hoisting and subsequent treatment.

The average number of employees at the Fecunis mine and concentrator was 109: 28 underground, and 81 on surface. E. N. Gilje was mine superintendent.

STRATHCONA MINE

The property comprises five claims located in Levack township, District of Sudbury. The mine address is Onaping.

Operations proceeded from 1 January to 31 December 1962, in three stages:

1. Shaft sinking—1 January to 5 July.
2. Change-over period—6 July to 21 October.
3. Development period—22 October to 31 December.

The vertical, four-compartment No. 1 shaft, located in the south half of lot 4, concession 4, Levack township was sunk 1,009 feet in 1962 to a total depth of 3,205 feet below surface. The 2,250-, 2,375-, 2,500-, 2,625-, 2,750-, 2,900-, 3,025-, and 3,150-foot levels were established.

Development work consisted of 110 feet of drifting, and 2,642 feet of cross-cutting. Total development footage, to 31 December 1962, consisted of 110 feet

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of drifts and 3,339 feet of crosscuts. Diamond-drilling consisted of two holes, totalling 694 feet, from underground.

New construction in 1962 was as follows:

- 1 compressor building (72 x 48 x 45 ft., concrete foundation, steel frame, tile walls, T-deck-built-up roof).
- 1 cooling tower (17 x 21 x 17 ft., concrete foundation and basin, timber tower).
- 1 storage building (40 x 40 x 12 ft., Butler building on concrete foundation, steel frame metal clad).

Added equipment included the following:

- 2 mine pumps (centrifugal 10-stage, 1000-gpm., 1,750-ft. head, Bepco Canada Ltd.).
- 4 mine pump electrical controls (700-hp., Canadian Westinghouse Ltd.).
- 3 mine pump motors (700-hp., English Electric Co. Ltd.).
- 2 rotary compressors, (10,000-cfm., 2,500-hp., Clark Compressor Co. Ltd.).
- 1 substation switch gear (7,500-kva., Canadian General Electric Co.).
- 2 transformers (7,500-kva., with structure, Rio Algom Mines Ltd.).
- 6 mine locomotives (Clayton 4.5-ton battery-operated, L. G. Jarvis Co. Ltd.).
- 75 mine cars (70-cu. ft. bottom-dump, Dorr-Oliver-Long).
- 3 shaft cages (aluminum and steel, double-decked, Wabi Iron Works).
- 1 gunite machine (Lecky model C-30-G, Lecky Machinery Co.).
- 6 rocker shovels (Eimco 24, Mine Equipment Co. Ltd.).
- 2 supply cars (Zimmerman 24-ft. long, Dorr-Oliver-Long).

A total of 1,009 tons of ore was hoisted and stockpiled.

The shaft sinking was on contract to McIsaacs Mining and Tunnelling, who employed an average of 11 men: 10 underground, and 1 on surface. Clarence Beaton was shaft captain. G. M. Proudfoot was superintendent for Falconbridge, who supplied an additional 10 men.

OUTSIDE EXPLORATION

Outside exploration on Sudbury Basin properties included 47 diamond-drillholes, totalling 74,074 feet, from surface and 23 holes, totalling 29,719 feet, from underground.

A total of 551 feet of drifting was the development footage completed in 1962 from the 2,650-foot level of the Levack mine of International Nickel Company of Canada Limited. Total development footage in this area, to 31 December 1962, was as follows: 1,764 feet of drifts; 133 feet of crosscuts; 129 feet of raises. Some 4,526 feet of drifting was done from the 3,600-foot level of the Fecunis mine for a total of 4,609 feet, to 31 December 1962.

The work was under the direction of E. L. Healy, manager, and A. M. Clarke, Falconbridge senior mine geologist.

FALCONBRIDGE ROCKHOUSE AND CONCENTRATOR

The plant address is Falconbridge.

Operations progressed from 1 January to 31 December 1962.

New construction was as follows:

- 1 concrete hopper (14 x 21 x 17 ft. with concrete approach apron, 16 x 24 ft.) at the concentrate receiving station.
- 1 extension to pelletizer plant (22.5 x 23.6 x 28.5 ft., concrete foundation, steel frame, tile walls, Haydite roof).
- 10,500 feet, stope-tailings pipeline (10-inch wood).

Equipment installed included the following:

- 1 dust collector (bag type with 4,000 sq. ft. cloth, 8,000 cfm at 6 in. w.g., Wheelabrator Corp. of Canada Ltd.), for fine crushing plant.
- 2 flotation machines (No. 30 sub A.4 cell, Denver Equipment Co. Ltd.).
- 1 agitator (wood, 18-ft. diam. with 40-hp. lightning mixer, Pacific Coast Pipe Ltd.).
- 3 pumps (8-x 6-in. SRL., Canadian Allis-Chalmers Ltd.).
- 2 cyclones (Krebs 20-in., Technequip Co. Ltd.).

During the year a total of 976,755 tons of ore was milled producing 134,257 tons of concentrate.

H. T. Berry was plant superintendent, W. R. Lyford was superintendent.

HARDY ROCKHOUSE AND CONCENTRATOR

The plant address is Onaping.

Operations proceeded from 1 January to 31 December 1962.

Added equipment was as follows:

- 10 flotation cells (Fagergren No. 56, Western Machinery).
- 1 mixer (Greey Lightning 40-hp., Greey Mining Equipment).
- 1 crusher head (Symons standard Nordberg Mfg. Co.).

During the year a total of 520,627 tons of ore was milled, and 101,298 tons of concentrate was produced.

The average number of employees was 65. Stan McQuitty was superintendent.

FECUNIS CONCENTRATOR

The plant address is Onaping.

Operations progressed for a total of 363 days from 1 January to 31 December 1962.

A dust collector was installed at the surface crusher (bag type with 1,786 sq. ft. cloth, 6,000 cfm. at 5.5 in. w.g., Wheelabrator Corp. of Canada Ltd.).

During the year a total of 866,508 tons of ore was milled at a daily average of 2,387 tons.

The average number of employees was 72. K. C. Mott was superintendent.

FALCONBRIDGE SMELTER AND PLANTS

The smelter and plants address is Falconbridge.

Operations proceeded from 1 January to 31 December 1962.

New construction in 1962 included a steel hopper (9 x 7 x 5 ft.) and a wood-stave tank (10 x 10 ft.), both on concrete foundations in the pyrrhotite plant; a general services building (Butler, 120 x 40 x 12 ft.), on concrete foundation; and a storage tank (Newell and Horton, capacity 250,000 gals.).

Added equipment consisted of the following:

- 1 heavy-duty wet pan in smelter (Carlin 7-ft. automatic, Pittsburg Foundry & Machine Co.).
- 2 payloaders (Hough H25, W. L. Ballantyne Co. Ltd.).
- 2 fans for sinter track ventilation (centrifugal, 40,000-cfm., hoods and 50-hp. motors, Joy Mfg. Co.).

The smelter treated concentrates from the Falconbridge, Hardy, and Fecunis concentrators producing 67,449.5 tons of nickel matte.

The average number of employees was 1,151. H. T. Berry was plant superintendent; H. F. C. Taylor was superintendent.

The following is taken from the company annual report for the year ending 31 December 1962:

Metal Deliveries and Prices

Nickel deliveries decreased from 65,546,000 pounds in 1961 to 61,061,000 pounds in 1962. This decrease was the result of the completion in August of stockpile deliveries under contract with the United States Government. Commercial deliveries in Europe were lower than in 1961, but higher deliveries in the United States resulted in higher total commercial deliveries, which were at a record level.

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Nickel prices averaged higher in 1962 than in 1961. The base price of nickel, which had remained unchanged for over four years, was increased in mid-1961 by $7\frac{1}{4}$ cents (U.S.) per pound. In May 1962, the company reduced its price by $2\frac{1}{4}$ cents (U.S.).

Copper deliveries decreased from 38,817,000 pounds in 1961 to 33,831,000 pounds in 1962. The lower deliveries were the result of lower production. Prices obtained for copper, which is sold in Europe, were relatively stable throughout the year and averaged slightly higher than in 1961.

Cobalt deliveries, which included deliveries to stockpile, decreased from 1,462,000 pounds in 1961 to 1,226,000 pounds in 1962, but deliveries to commercial customers were higher in 1962 than in 1961. The price for cobalt remained unchanged throughout the year.

The returns for all metals realized by the company in Canadian currency were favourably affected by the devaluation of the Canadian dollar. The exchange value of the United States dollar, the currency used in pricing most of the company's products, averaged Canadian \$1.07 in 1962 as compared with Canadian \$1.01 in 1961.

Mines

	1962	1961
Ore delivered to treatment plants from company mines tons	2,407,520	2,531,933
Development advances feet	37,837	26,070
Diamond-drilling feet	202,335	195,314

Ore deliveries from company mines were slightly lower than in 1961. More than half of this production came from the mines located on the north rim of the Sudbury Basin.

Development of the Falconbridge mine below the 4,025-foot level proceeded throughout the year with drifting confined to five levels including the bottom, 6,050-foot, level. Apart from this level, the main work was on the three upper levels of the block, where sufficient advances were made to include a moderate amount of ore in the developed ore reserves. Although results continued to be disappointing on the 6,050-foot level in the main mine area, a considerable length of ore was uncovered by the drive under the East mine area.

At the East mine substantial progress was made towards preparing the section between the 2,800- and 4,025-foot levels for production. A contract was let to sink an internal shaft from the 4,025-foot level to the 6,050-foot level; and by the year's end the access drifts and hoist-room were completed.

Ore from the Onaping mine, which came into production in late 1961, has compensated for both the loss of ore due to the closing of the Longvack mine and for lower production from the Hardy mine.

The Fecunis mine produced at full capacity during the year. Drifting on the 3,600-foot level to explore the norite contact to the east was continued throughout the year.

Sinking of the four-compartment shaft at the Strathcona mine was completed at a depth of 3,205 feet below the collar. Lateral development, preparatory to a major underground diamond-drilling program to outline the ore, was underway at the year's end.

Treatment Plants

	1962	1961
Ore and concentrates delivered to treatment plants from all sources.	tons 2,461,526	tons 2,639,897
Ore milled to produce concentrates	2,353,646	2,443,453
Ore and concentrates smelted	487,941	588,177

Regrind and magnetic separation equipment, installed in the milling plants in 1961 and 1962, has resulted in continued improvement in metal recoveries. Upgrading of the smelter feed, resulted in a further significant increase in nickel produced per ton smelted, and a consequent decrease in the total tons smelted.

Research

The Research and Development Department was enlarged to provide for broadened technical services, process and product development and research. A new department of Physical Metallurgy has been established, and expansion of the research laboratory at Richvale to provide facilities was underway at the year's end.

At Falconbridge, research and development activities included rock mechanics, mining practices, ammonium nitrate and fuel oil blasting applications and improvement of concentration and smelting efficiencies. Process developments on pilot plant scales were continued at the refinery in Norway and in the Dominican Republic.

Ore Reserves

SUMMARY OF ORE RESERVES AT THE YEAR'S END:

	Ore	Nickel	Copper
	tons	percent	percent
DEVELOPED ORE Falconbridge, East, Hardy, Fecunis, and Onaping.	21,096,850	1.62	0.84
INDICATED ORE Sudbury District.	27,166,150	1.32	0.77
Total.	48,263,000	1.45	0.80

Ore additions in 1962 of 4,423,000 tons were sufficient to compensate for 2,407,000 tons withdrawn from the mines during the year and to add a further 2,016,000 tons to reserves.

The grade of the reserves remained the same as in the previous year. Reserves of developed ore increased by 879,000 tons and indicated ore by 1,137,000 tons.

The average number of employees, excluding employees of contractors, employed at mining operations in Ontario was 2,945, of which 1,157 were employed underground. E. L. Healy was manager of the Nickel Division, Sudbury operations; J. H. Fraser was general superintendent of the Falconbridge area operations; G. A. Allen was general superintendent of the Onaping area operations.

Fidelity Mining Investments Limited

Fidelity Mining Investments Limited was incorporated in April 1958 with an authorized capitalization of 3,000,000 shares of no par value, of which 1,272,571 shares have been issued. The directors and officers were: L. G. Phelan, president and director; H. J. Kirby, vice-president and director; G. V. Kirby, secretary-treasurer and director; H. Shlesinger, assistant secretary. The head office is at Suite 403, 62 Richmond Street West, Toronto 1. The mine address is Boston Creek.

The company carried out mining operations at the Cam Copper Mine (formerly Trethewey-Ossian), comprising eight claims located in Pacaud township, District of Timiskaming, near Boston Creek.

Operations proceeded from 1 January to 1 November 1962. The vertical, two-compartment Trethewey-Ossian shaft on claim No. 52236, lot 3, concession V, some 220 feet deep with levels at 125 and 200 feet, was dewatered in January. An inclined raise, some 165 feet long, was driven from the 125-foot level to surface, and a small vein containing chalcopyrite was mined. A total of 1,700 tons of ore was hoisted by bucket from the 200-foot level and passed over a picking belt where 1,000 tons was discarded; 700 tons was trucked to the Boston Creek railway station and shipped to the Noranda smelter. Some 400 feet of surface-trenching averaging two feet in depth was completed. Diamond-drilling consisted of 12 holes, totalling 200 feet from underground and nine holes, totalling 2,240 feet, from surface.

Robert Roach was manager, and six men were employed during the period of operation.

Geco Mines Limited

Geco Mines Limited was incorporated in October 1953, with an authorized capitalization of 3,000,000 shares of \$1 par value; all shares have been issued. The directors and officers were: N. C. Urquhart, president and director; J. A. H.

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Paterson, vice-president, general manager, and director; P. D. P. Hamilton, R. T. Birks, J. R. Bradfield, R. M. P. Hamilton, J. D. Perrin, R. V. Porritt, and W. S. Row, directors; William Harrison, secretary; D. A. Foster, treasurer. The head office is at 44 King Street West, Toronto. The mine address is Manitouwadge.

The property comprises sixty-six claims in the Manitouwadge Lake area, Port Arthur Mining Division, District of Thunder Bay.

Mining and milling continued throughout 1962.

SHAFTS, GECO MINE

Shaft	Claim No.	Inclination	Number of Compartments	Total Depth from Surface
No. 1	T.B.46849	Vertical	5	feet 2,459
No. 2 below 50-foot level, or No. 1 west adit	T.B.46849	Vertical	3	505
No. 3 below 1,050-foot level	T.B.46849	Vertical	3	2,565

No. 1 shaft, which had been sunk 897 feet in 1961, was sunk a further 86 feet in 1962 to a total depth of 2,459 feet below surface.

The following development work was done during the year: drifting and crosscutting, 28,806 feet; raising, 11,028 feet. The total development footage to 31 December 1962 was as follows: 156,743 feet of drifts and crosscuts; 50,475 feet of raises. Diamond-drilling consisted of 13 holes, totalling 6,625 feet, from surface and 407 holes from underground, totalling 108,600 feet.

New construction in 1962 consisted of a Butler building (120 x 32 feet, steel frame, metal clad).

New equipment added was as follows:

- 1 Pump (8-in., Vaseal, Peacock Bros. Limited).
- 1 Hough H-70 used payloader (The Frank G. Hough Company).
- 1 Caterpillar tractor (D-6 Caterpillar Tractor Company).
- 2 Pick-up trucks (½-ton capacity General Motors Corp. (Canada) Ltd.).
- 2 Mechanical loaders (Atlas Copco Canada Ltd.).
- 2 Portable mine centres (300-kva., Canadian Westinghouse Co. Ltd.).
- 2 Production slushers (R-222, Joy Manufacturing Co. Ltd.).
- 2 Tugger hoists (Eimco, Mine Equipment Company Limited).
- 6 Stoper rock drills (Atlas Copco Canada Limited).
- 2 Centrifugal pumps (Canadian Ingersoll-Rand Co. Ltd.).
- 2 Motors (200-hp., Canadian Westinghouse Co. Ltd.).
- 1 Switchgear unit, outdoors (Northern Electric Co. Ltd.).
- 1 Water storage tank (wooden, 10,000 gal., Pacific Coast Pipe Limited).

The following is taken from the company annual report for the year ending 31 December 1962:

Mining

In the month of May all installations in connection with the extension of the main No.1 shaft and with the No. 3 crusher complex were put into operation; this permitted production of mill feed from that section of the orebody lying immediately east of No. 1 shaft.

A decision was made in June to develop the east end of the mine at depth by means of a new production shaft from surface. This shaft, to be known as No. 4, will extend to approximately the 4,050-foot level. A large amount of information as to the competence of ground for this project was obtained by diamond-drilling, both on surface and underground, and by advance of shaft crosscuts on both the 1,850- and 2,450-foot levels. The final location was fixed in November about 4,000 feet southeast of the main plant.

Exploration drives were advanced east of No. 3 shaft on the six main levels from the 1,450-foot down. Pattern diamond-drilling was also carried out on the same levels, but this information was not complete at the end of the year.

Stope preparation was again continuous east of the main shaft all the way from the 450-foot level to the 1,750-foot sublevel. This work accounted for about 50 percent of the advance in the mine for the year.

In the B block of stopes immediately west of No. 1 shaft, where pillar failures had occurred early in 1961, recovery work was close to completion, and no problems were encountered. Broken-ore remnants in the original A zone section to the west were close to complete recovery. Ore production for the year was 91 percent from blast-hole mining.

Milling

The mill operated 94.34 percent of the possible time during the year, and averaged 3,513 tons per day as compared to 3,498 tons per day in 1961.

There were no major difficulties in the mechanical operation of the mill or crushing plants. Equipment for the recovery of tailings sands was placed in operation, and 12,460 tons of backfill was delivered to the mine on an experimental basis.

During the latter half of the year, mill feed became more refractory as production from the C block stopes was increased. As a result, concentrate grades tended to be lower and smelter penalties to be higher. Preliminary investigations indicate that the ore minerals are more finely disseminated, and finer grinding will be required to effect liberation for flotation purposes.

Research was also continued in evaluating various flotation and thickening reagents, and reduction of concentrate moistures.

Metal recoveries for the year averaged:

	PERCENT
Copper	94.88
Silver	78.09
Zinc	82.16

Production

	1962	1961
ORE MILLED..... dry tons	1,282,414	1,276,778
Calculated grade:		
Copper..... percent	1.81	1.54
Zinc..... percent	4.68	3.99
Silver..... oz. per ton	2.14	1.52
Gold..... oz. per ton	trace	trace
COPPER CONCENTRATE PRODUCED..... dry tons	82,058	67,551
Grade:		
Copper..... percent	26.70	27.43
Silver..... oz. per ton	24.33	21.79
Gold..... oz. per ton	0.057	0.065
ZINC CONCENTRATE PRODUCED..... dry tons	91,641	77,379
Grade:		
Zinc..... percent	53.86	54.29
LEAD CONCENTRATE PRODUCED..... dry tons	2,218	788
Grade:		
Lead..... percent	44.27	51.07
Silver..... oz. per ton	49.81	69.85
Copper..... percent	3.35	4.63
REVENUE METAL IN ABOVE CONCENTRATES:		
Copper..... lb.	43,968,322	37,131,892
Zinc..... lb.	98,714,406	84,010,507
Lead..... lb.	1,963,783	805,140
Silver..... oz.	2,106,694	1,526,976
Gold..... oz.	4,776	4,405

Copper concentrates produced were shipped to the Noranda smelter. Zinc concentrates were shipped to smelters in the United States and Europe, and at the end of the year, 9,170 dry tons of zinc concentrates, containing 9,836,400 pounds of zinc, were stored on stockpile at the plant. Lead concentrates were again shipped to the smelter in western United States.

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Ore Reserves

Based on pattern diamond-drilling completed during the year and on detailed re-calculation, ore reserves are estimated as follows:

Year	Total Ore	Averages		
		Copper	Zinc	Silver
	tons	percent	percent	ounces
1962.....	22,046,000	2.00	4.67	2.29
1961.....	18,269,000	1.94	4.23	2.32

Grades and tonnages quoted include an allowance for dilution of 10 percent.

The prices for metals used to evaluate for ore reserve purposes were:

	CANADIAN FUNDS
Copper.....	per lb. \$ 0.30
Zinc.....	per lb. 0.11
Silver.....	per oz. 1.00
Gold.....	per oz. 35.00

The average number of employees was 564: 232 underground, and 332 on surface. J. A. Graham was mine manager.

International Nickel Company of Canada Limited

International Nickel Company of Canada Limited was incorporated in 1916 under Dominion of Canada charter; in 1957 all issued preferred shares of stock were redeemed for cash, and all authorized, but not issued, preferred shares were cancelled; in April 1960, the authorized capitalization was increased to 36,000,000 shares of no par value, of which 29,445,324 shares have been issued.

The officers of the company in 1962 were as follows: H. S. Wingate, chairman and chief officer; J. R. Gordon, president; R. D. Parker, senior vice-president; J. C. Parlee, vice-president; T. M. Gaetz, general manager (Ontario Division); W. A. McCadden, comptroller; W. F. Kennedy, secretary; F. M. A. Noblet, treasurer; J. A. Piggott, assistant general manager (Ontario Division); Alex Godfrey, and G. A. Harcourt, assistants to vice-president; J. McCreedy, superintendent of mines; R. R. Saddington, manager of reduction plants; W. R. Koth, manager (copper-refining division, Sudbury); J. H. Tuck, manager (Nickel Refining Division, Port Colborne).

The executive office is at 67 Wall Street, New York 5, N.Y., U.S.A., and the general offices are at Copper Cliff. The Toronto office is at 55 Yonge Street, Toronto 1.

The company and its subsidiary companies operate: hydro-electric plants; nickel-copper mines in the Sudbury district; a smelter refinery and iron ore recovery plant at Copper Cliff; and a refinery at Port Colborne. Operations outside the province include: refineries at Acton, England, and Clydach, Wales; rolling mills at Birmingham, England, Huntington, W.Va., U.S.A., and Glasgow, Scotland; and a foundry at Bayonne, N.J., U.S.A. In 1961 the company's new nickel mining, smelting, and refining project at Thompson, Manitoba, was completed and brought into full operation, thereby increasing the nickel production capacity to 400,000,000 pounds per year.

SHAFTS, INTERNATIONAL NICKEL COMPANY'S MINES, SUDBURY AREA

	Inclination	Number of Compartments	Sinking in 1962	Total Depth from Surface feet	
CREAN HILL					
No. 1 shaft	57° to 305 ft. 71° to bottom	3	—	797	
No. 2 shaft		5	—	2,115	
CREIGHTON					
No. 2.0 shaft ⁽¹⁾	65°	2	—	314	
No. 3 shaft	55°	5	—	1,946	
No. 4 shaft (internal collared at 1,477-foot depth) ⁽¹⁾	50°	5	—	2,702	
No. 5 shaft	Vertical	6	—	4,074	
No. 6 shaft (internal collared at 3,822-foot depth)	Vertical	5	—	5,562	
No. 7 shaft	Vertical	3	—	2,056	
No. 65 winze (collared at 3,819-foot depth) ⁽²⁾	65°	3	—	4,320	
No. 8 shaft (internal, collared at 5,017-foot depth)	Vertical	3	—	6,746	
FROOD-STOBIE					
No. 1 shaft ⁽³⁾	77° to 1,300 ft. 61° to bottom	2	—	3,097	
No. 3 shaft		6	—	3,040	
No. 4 shaft ⁽⁴⁾	Vertical	3	—	3,928	
No. 6 shaft (internal collared at 2,872-foot depth)	Vertical	3	—	3,391	
No. 7 shaft	Vertical	5	—	3,105	
No. 8 shaft	Vertical	3	—	2,624	
GARSON					
No. 1 shaft ⁽⁵⁾	Vertical	3	—	1,457	
No. 2 shaft	Vertical	5	—	4,243	
No. 3 shaft (internal collared at 4,000-foot depth)	Vertical	2	112	5,126	
LEVACK					
No. 1 shaft ⁽²⁾	65°	3	—	983	
No. 2 shaft	Vertical	6 to 2,910 ft. 5 to 2,973 ft. 4 to bottom	—	3,915	
No. 3 shaft (internal collared at 1,594-foot depth)	Vertical		3	—	3,716
MURRAY					
No. 1 shaft ⁽⁶⁾	36°	3	—	593	
No. 1 winze (collar at 470-foot depth) ⁽⁶⁾	36°	2	—	775	
No. 2 shaft	Vertical	5	—	3,298	
No. 3 shaft (collar at 2,994 feet)	Vertical	2	436	3,430	
VICTOR					
No. 1 shaft	Vertical	3	—	362	
COPPER CLIFF NORTH					
No. 1 shaft	Vertical	5	2,055	2,105	

(1) Abandoned for hoisting purposes.
 (2) Abandoned for hoisting purposes; used as a fresh-air intake.
 (3) Abandoned and filled above the 600-foot level; the lower part continues to serve as a fresh-air intake.
 (4) Abandoned above the 600-foot level; now serves as an inside shaft for lower levels of the Frood-Stobie mine.
 (5) Abandoned for hoisting purposes; used as an escapeway.
 (6) Now used as a main return airway.

CREAN HILL MINE

Operations continued from 1 January to 31 May 1962, when the mine was closed for an indefinite period. The mine was being kept dewatered and the plant being maintained to provide services for the Ellen pit.

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Development work consisted of 79 feet of drifting and crosscutting. Total development footage, to 31 December 1962, was as follows: 48,604 feet of drifts and crosscuts; 12,554 feet of raises. Diamond-drilling in 1962 consisted of nine holes, totalling 9,800 feet, from underground.

New equipment added included the following:

- 10 stoper drills (RB83, Gardner-Denver).
- 1 battery (T125/LR4/6AEC/NIFE-92LR4, Amalgamated Electric Corp. Ltd.).
- 3 storage batteries (D8 N, cadmium 66-cell, Amalgamated Electric Corp. Ltd.).

The average number of employees was 31: 16 underground, and 15 on surface. R. H. Brown was superintendent.

CREIGHTON MINE

Operations continued throughout the year.

Development work consisted of: 19,340 feet of drifting and crosscutting; 7,617 feet of raising. Total development footage, to 31 December 1962, was as follows: 429,632 feet of drifts and crosscuts; 209,111 feet of raises. A total of 199 diamond-drillholes, totalling 79,167 feet, was completed in 1962 from underground.

New equipment included the following:

- 8 fans, vane-axial (Joy Alpha 18-14-3450, Joy Mfg. Co. Canada Ltd., Winnipeg).
- 1 motor (300-hp. John Inglis Co. Ltd., Toronto).
- 1 fan (size 730, type BL, 45,000-cfm., The Canadian Blower & Forge Co., Kitchener).
- 1 concrete gun rig (Ridley, model C-3-UG, Lecky Machinery Ltd., Haileybury).
- 1 battery charger (Silicon type KG-17, Northern Electric Co. Ltd., Toronto).
- 2 drills (BBS-2 UUG with air motors, Boyles Bros. Drilling Co. Ltd., Vancouver).
- 1 transformer (75-kva Acme Elec. Corp. Ltd., Toronto).
- 10 Granby cars (110-cu. ft., Dorr-Oliver-Long Co. Ltd., Orillia).

A total of 3,439,786 tons of ore, averaging 13,437 tons daily, was hoisted and shipped for treatment.

The average number of employees was 1,925: 1,519 underground, and 406 on surface. E. E. Mumford was superintendent.

FROOD-STOBIE MINE

Operations continued throughout the year.

Development work comprised: 16,047 feet of drifting and crosscutting; 7,714 feet of raising. Total development footage, to 31 December 1961, was as follows: 519,606 feet of drifts and crosscuts; 204,452 feet of raises. Some 86 diamond-drillholes, totalling 10,768 feet, were drilled from underground in 1962.

New construction consisted of a sand-fill plant (one storey, 174 x 54 x 27 feet).

New equipment added was as follows:

- 40 ore cars (Granby 110-cu. ft., Dorr-Oliver-Long Ltd., Orillia).
- 2 pumps (centrifugal 2 5/6 DL, single stage, Babcock-Wilcox & Goldie-McCulloch Ltd., Galt).
- 1 pump (Mather & Platt, size 11A, 5CHR, Mine Equipment Co. Ltd., Montreal).
- 1 hoist (D6U, Canadian Ingersoll-Rand Co. Ltd.).
- 1 hoist (HUL, Canadian Ingersoll-Rand Co. Ltd.).
- 1 storage water tank (wood-stave, 100,000 U.S. gals., Canadian Wood, Pipe & Tanks Ltd., Vancouver).
- 1 car shakeout with H. O. Robins & Myers hoist (Hewitt-Robins Canada Ltd., Montreal).
- 1 heater (Dravo Counterflo, model 200G-02, Marine Industries Ltd., Sorel).
- 2 drills (BBS-2UUG with air motors, Boyles Bros. Drilling Company, Vancouver).

A total of 3,502,425 tons of ore at a daily average of 13,667 tons was hoisted and shipped for further treatment.

The average number of employees was 2,808: 2,223 underground, and 585 on surface. S. J. Sheehan was superintendent.

GARSON MINE

Operations continued throughout the year.

The No. 3 vertical, two-compartment, internal shaft, collared at a depth of 4,000 feet, was sunk 112 feet to a total depth of 5,126 feet below surface.

Development work during the year consisted of: 3,414 feet of drifting and crosscutting; 2,738 feet of raising. Total development footage, to 31 December 1962, was as follows: 221,885 feet of drifts and crosscuts; 97,835 feet of raises. Some 107 diamond-drillholes, totalling 20,460 feet, were drilled from underground in 1962, which included 45 holes, totalling 5,934 feet, drilled at Falconbridge East.

New equipment added was as follows:

- 10 mine cars (Granby 110-cu. ft., Dorr-Oliver-Long).
- 1 pump (vertical turbine, 20-stage, Babcock-Wilcox & Goldie-McCulloch).
- 1 locomotive (8-ton, type 1588-24-60-T, Goodman Mfg. Co. Ltd., Chicago U.S.A.).
- 1 rectifier (Wells Silicon fan-cooled, Kingston Lee Watson Co. Ltd., North Bay).
- 1 loader (24-in. gauge, Atlas Copco Canada Ltd., Dorval).

A total of 1,096,668 tons of ore at a daily average of 4,284 tons, was hoisted and shipped for further treatment.

The average number of employees was 1,012: 833 underground, and 179 on surface. B. T. King was superintendent.

LEVACK MINE

Operations continued throughout the year.

Development work in 1962 consisted of: 4,690 feet of drifting and crosscutting; 3,435 feet of raising. Total development footage, to 31 December 1962, was as follows: 251,662 feet of drifts and crosscuts; 79,966 feet of raises. Some 149 diamond-drillholes, totalling 46,029 feet, were drilled from underground in 1962.

A total of 1,707,170 tons of ore, at a daily average of 6,669 tons, was hoisted and shipped for further treatment.

The average number of employees was 1,832: 1,498 underground, and 334 on surface. V. H. Ritzel was superintendent.

MURRAY MINE

Operations continued throughout the year.

The vertical, two-compartment No. 3 winze, collared at 2,994 feet, was sunk 436 feet to a depth 3,430 feet below surface. The 3,200- and 3,400-foot levels were established at depths of 210 and 420 feet, respectively, below the winze collar.

Development work in 1962 included: 1,184 feet of drifting and crosscutting; 1,114 feet of raising. Total development footage, to 31 December 1962, was as follows: 171,566 feet of drifts and crosscuts; 38,702 feet of raises. Some 14 diamond-drillholes, totalling 969 feet, were drilled from underground in 1962.

Added equipment included: one pump (5 x 3 in., four-stage double suction, type CMSK) and two sump pumps (No. 35, Canadian Allis-Chalmers Ltd., Montreal).

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A total of 1,093,771 tons of ore, at a daily average of 4,306 tons, was hoisted and shipped for further treatment.

The average number of employees was 513: 387 underground, and 126 on surface. H. W. Smith was superintendent.

ELLEN OPEN PIT

Work at the Ellen open-pit continued from 1 January to 30 April. The pit, located about two miles east of the Crean Hill mine, commenced ore production averaging 1,500 tons daily early in 1961. The ore is trucked to the primary crusher on surface at the Crean Hill mine and after crushing is transported by railway to the Copper Cliff concentrator.

Churn-drilling for ore production consisted of 113 holes totalling 3,301 feet. A total of 78,998 tons of ore was mined and shipped.

The average number of employees was 42: 23 in the pit, and 19 on surface. R. H. Brown was superintendent.

CLARABELLE OPEN PIT

Operations at the Clarabelle open pit, located between Copper Cliff and the Murray mine, progressed throughout 1962.

Construction of a service garage, shops, and warehouse, primary crushing plant, the conveyor gallery, and take-up house, commenced in 1961, was completed in 1962.

New equipment installed included a sampler with Galigher chain drive (96-in., model CS-400, Canadian Locomotive Co. Ltd., Kingston).

Some 1,029 churn-drillholes, totalling 59,621 feet, and 62 rotary-drillholes, totalling 1,454 feet, were drilled for production purposes. A total of 1,488,950 tons of ore was mined and trucked to the rockhouse at an average of 5,850 tons daily during the year.

The average number of employees was 272: 118 in the pit, and 154 on surface. N. A. Creet was superintendent.

COPPER CLIFF NORTH MINE

The sinking of the vertical, five-compartment, No. 1 shaft was commenced on contract, and 50 feet had been completed in 1960. The surface plant, commenced in 1961, was completed in 1962, and the shaft was sunk 2,055 feet to a depth of 2,105 feet below surface. The shaft dimensions inside the concrete lining were 18 by 14.5 feet. The 400-, 600-, 800-, 1,000-, 1,200-, 1,400-, 1,600-, and 1,800-foot levels were established.

Total development footage consisted of 243 feet of drifting and crosscutting, and 174 feet of raising, which is the total to 31 December 1962.

New equipment installed was as follows:

- 5 chain hoists (Wright 6-ton cap, Upton Bradeen & James Ltd., Toronto).
- 1 hoist recorder (model B, Logan Engineering Co. Ltd., Chicago U.S.A.).
- 1 air winch (Hyla, with dead-man control, Holman Bros. Canada Ltd., Kitchener).
- 3 transformers (50-kva., 600-v, Acme Electric Corp. Ltd., Toronto).

The average number of employees by the shaft contractor was 38: 22 underground, and 16 on surface.

LAWSON QUARRY

The quarry is operated to supply quartzite rock used as a flux in Sudbury smelting operations. The quarry address is Willisville.

Some 113 churn-drillholes, totalling 8,097 feet, and two rotary-drillholes, totalling 140 feet, were drilled for quartzite production in 1962.

A boiler (Marathon Package, MO 60-S, Dominion Bridge Co. Ltd., Toronto) was installed.

A total of 409,308 tons of quartzite was mined and delivered to the rock-house; 406,908 tons were shipped at a daily average of 1,602 tons.

The average number of employees was 30. W. G. Tilston was superintendent.

CREIGHTON MILL CONCENTRATOR

The Creighton mill treated 3,059,540 tons of ore, averaging 8,283 tons daily, to produce concentrates, which were pumped to the Copper Cliff smelter.

The average number of employees was 101. E. McMullen was superintendent.

COPPER CLIFF CONCENTRATOR

The Copper Cliff concentrator treated 6,753,713 tons of ore, averaging 18,503 tons daily, to produce concentrates.

New construction included an addition to the office (126 x 12 x 20 ft.) and a heater house.

New equipment installed included the following:

- 35 separators (Eriez magnetic type DA, Eriez of Canada Ltd., Toronto).
- 4 rectifiers (silicon type 300-kw., Northern Electric Co. Ltd., Toronto).
- 2 ball mills (Marcy, 10.7 ft. long, 13-ft. diam., Canadian Vickers Ltd., Montreal).
- 2 motor generator sets (type LD, 13-kw., Canadian General Electric Ltd., Toronto).
- 1 crane (Whiting motorized, 15-ton double girder, Whiting Corp Canada Ltd., Welland).
- 2 pumps, centrifugal sand (14-x 12-in. Wilkinson-Linnotex Co. Ltd., Montreal).
- 4 transformers (750-kva, indoor dry type, Canadian Westinghouse Co. Ltd. Toronto).
- 4 transformers (750-kva, HV6900 LV575, Acme Electric Corp. Ltd., Toronto).
- 7 pumps (centrifugal type SRL.C, 10-x 8-in., Canadian Allis Chalmers Ltd. Montreal).

J. Lee was superintendent.

LEVACK MILL

A total of 1,710,608 tons of ore was milled at an average of 4,687 tons daily.

The average number of employees was 82. G. H. Morrison was superintendent.

CONISTON SMELTER

The Coniston smelter treated 299,525 tons of concentrate producing 36,077 tons of bessemer matte.

New equipment installed included the following:

- 1 chlorinator (V-notch, capacity 150 lb./hr., Wallace & Tierman Ltd., Scarborough).

The average number of employees was 540. R. L. Snitch was superintendent.

COPPER CLIFF SMELTER

The production from the smelter was 171,924 tons of nickel matte, 12,043 tons of nickel oxide sinter, and 128,800 tons of converter copper.

New construction consisted of an extension to the shipping area of the fluid bed roaster building (four storeys, 71 x 79 x 68 ft.).

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New equipment installed was as follows:

- 1 car shakeout (H.D. model 126, Hewitt-Robins Canada Ltd., Montreal).
- 1 traxcavator (Caterpillar 955 series H., Glow Crothers Ltd., Toronto).
- 4 flow meter panels (Republic, Rockwell Mfg. Co. of Canada Ltd., Guelph).
- 2 motors (150-hp. 1800/3/60/550 FR 675, Tamper Ltd., Montreal).
- 2 separators for intercoolers (1170-L-1, Canadian Ingersoll-Rand Co. Ltd., Montreal).
- 1 blast cleaning machine (Sanstrum model BRW-26, General Supply Co. of Canada, Toronto).
- 2 transformers (300-kva., 7200-v Acme Electric Corp. Ltd., Toronto).
- 1 pump, centrifugal (Gorman Rupp, 6-x 6-in., W. L. Ballentine Co. Ltd., Toronto).
- 2 pallet transporters (model WP42736, capacity 2-ton, H. C. Burton Co. Ltd., Hamilton).
- 1 fan (998 TVID design 2ARR7, capacity 34,000 cfm.).
- 3 vibrating screens (Dillon model 70, Denver Equipment Co. of Canada Ltd., Toronto).
- 1 fan (size 33, type SCR-5, Canadian Blower & Forge Co. Ltd., Kitchener).
- 1 motor (150-hp., 1200/60/550, Hawker-Siddeley Canada Ltd., Toronto).
- 1 tank, water storage (steel, 66-ft. diam. 48 ft. high, 1,000,000 gals. (U.S.), Sparling Tanks Ltd., Toronto).
- 2 conveyors (Roller Flight, Jarvis B. Webb Co. Ltd., Hamilton).

The average number of employees at the Copper Cliff concentrator and smelter was 5,423. J. N. Lilley, superintendent of smelters was in charge.

IRON ORE RECOVERY PLANT

The iron ore recovery plant produced 248,294 tons of iron ore, averaging 680 tons daily.

Construction of the following buildings, commenced in 1961, continued in 1962: roaster-kiln building addition, ammonia-leaching building addition, recovery-building addition, office and changehouse addition, thickener station and pumphouse, shops and warehouse.

Construction of the following buildings commenced in 1962:

- Pelletizing plant addition (six storeys, 352 x 50 and 134 x 104 ft.).
- Cooling tower (power plant, 144 x 30 x 35.8 ft.).
- Pumphouse (one storey, 16 x 16 x 10 ft.).
- Powerhouse (one storey, 203 x 170 x 51 ft.).
- Effluent power house (one storey, 41.5 x 19.3 x 19.5 ft.).
- Cooling tower addition (144 x 30 x 35.8 ft.).
- Pumping station (37.3 x 35.3 x 17.3 ft.).

The installation of major equipment in the various buildings was commenced.

The average number of employees was 433. E. Bracken was superintendent.

COPPER CLIFF REFINERY

The Copper Cliff refinery produces copper cathodes and shapes, nickel sulphate, gold, silver, tellurium, selenium, and semi-refined platinum metals.

A total of 128,764 tons of converter copper and 484 tons of scrap and secondary copper was refined to produce 127,304 tons of refined copper.

New equipment added included:

- 1 fork-lift truck (model S-40, A. R. Williams Machinery Co. Ltd.).
- 1 crane controller (Railway Power Engineering Corp. Ltd.).
- 76 deposition tanks (made by copper refining division).
- 1 nitric acid tank (Steel Fabricating & Welding Ltd.).
- Gas analysing and recording equipment (Bailey Meter Co. Ltd.).

The average number of employees was 819. W. R. Koth was manager.

PORT COLBORNE REFINERY

The Port Colborne refinery produces nickel cathodes, shot, ingots, and oxides; cobalt cathodes.

Pilot-plant facilities were expanded in 1962. The development of processes permitting improved recoveries and greater utilization of the ores was under active investigation in the research stations. A number of plant and process improvements were made.

The average number of employees was 1,963. J. H. Tuck was manager.

The following is taken from the company annual report for the year ending 31 December 1962:

Mines

Total ore production from the mines in Ontario and Manitoba during 1962 amounted to 13,794,000 tons. This compares with 17,489,000 tons in 1961.

In the autumn of 1962 a curtailment in production in the mines and plants in Canada was made in order to conform with market requirements. As a result, a substantial layoff of employees was necessary at the operations in the Sudbury District and at the Port Colborne refinery.

Development was continued at the Creighton, Garson, and Murray mines, to provide access to lower horizons preparatory to deep level exploration. At the Copper Cliff North mine, the sinking of a 3,000-foot shaft was continued throughout the year, and at the year's end, a depth of 2,105 feet had been reached. The new operation at the Clarabelle open-pit mine reached its scheduled capacity during the second quarter of 1962. Production from the Ellen open-pit mine has been suspended.

Large-scale tests at the Frood mine, under practical working conditions, were conducted on waterborne sand fill stabilized with small additions of Portland cement. The use of this self-supporting cemented sand fill has been adapted to our operations and is expected to result in substantial economies in timber requirements, decreased dilution of ore, and greater flexibility in mining methods.

The use of a mixture of ammonium nitrate and fuel oil as a blasting agent, replacing high explosives, was extended to all of our mining operations in the Sudbury District. This has resulted in a substantial reduction in the cost of mine explosives.

Ore Reserves

The proven-ore reserves of the Sudbury District and Manitoba mines increased during the year, and at 31 December 1962, stood at 299,416,000 tons, with a nickel-copper content of 9,006,300 tons. At the end of 1961, the proven-ore reserves stood at 297,419,000 tons, with a nickel-copper content of 8,937,300 tons.

Plant and Process Improvements

Construction of the expansion of the iron ore recovery plant at Copper Cliff progressed favorably. This major project was started in 1961 and involves an estimated capital outlay of \$50,000,000. The first of the four new units of the plant is scheduled for operation in March 1963, and additional units by July 1963. Canadian Industries Limited is also acquiring additional facilities to increase their output of sulphuric acid, produced from the gas generated by the plant's pyrrhotite roasters.

During the year construction was completed on facilities to provide a new supply of potable water for the Copper Cliff area; this will result in an increase in the reliability of the water supply and in substantial savings in steam production costs at the iron ore recovery plant, the Copper Cliff smelter, and the copper refinery.

At the Copper Cliff mill, work continued on modernizing the flotation section and providing increased capacity for pyrrhotite recovery.

The company continued to operate its research stations at Port Colborne for the development of new and more economic processes for the treatment of ores and intermediate products.

The company employed in Ontario, excluding employees of contractors, an average of 15,994 persons; at mines, 5,149 underground, and 1,484 on surface; at concentrators, smelters, refineries, and iron ore recovery plants, 9,361 persons.

Kam-Kotia Porcupine Mines Limited

Kam-Kotia Porcupine Mines Limited was incorporated in August 1932, with an authorized capitalization of 4,000,000 shares of no par value, of which 800,000 shares have been issued. The directors and officers were: A. W. White,

Mill heads ranged from a low of 1.69 percent to a high of 2.37 percent copper. Recovery in milling ranged between 79.4 percent and 91.8 percent, depending primarily on the amount of sulphides (pyrite, pyrrhotite, chalcopyrite, sphalerite) present in the ore.

During the year the company produced, and will receive credit for, 16,355 ounces of silver. Grinding steel consumption (balls and rods) averaged 3.546 pounds per ton milled. Re-agent consumption was as follows:

	POUNDS PER TON MILLED
Soda ash.....	0.451
Lime.....	2.870
Amyl xanthate.....	0.559
Sodium cyanide.....	0.016
Dow froth 250.....	0.019
Zinc sulphate.....	0.017

Ore Reserves

Ore reserves as at 1 January 1963, adjusted for tonnage mined and additional structural information gained during the year, are shown here:

Copper Ore	Average Copper Content	
	tons	percent
Open-pit ore plus high-grade stockpiles.....	592,959	1.758
B zone.....	1,170,528	2.174
Ore below open pit and east of pit (recoverable by underground mining).....	114,456	1.655
C zone.....	146,584	1.197
North zone (in hanging wall of open pit).....	90,983	1.154
Low-grade ore ⁽¹⁾	313,200	0.80
Total.....	2,428,710	—

⁽¹⁾The low-grade ore will be mined, hauled, and stockpiled during normal pit operations for milling at scheduled periods in the future. About 170,000 tons of this material has already been mined and stockpiled.

Substantial tonnages of new ore were indicated by diamond-drilling. Despite the milling of 376,533 tons, grading 1.95 percent copper during the year, copper ore reserves were increased from 1,346,191 tons at 1.600 percent copper as at 1 January 1962, to 2,428,710 tons at 1.788 percent copper as at 1 January 1963.

Zinc Ore	Average Zinc Content	
	tons	percent
(a) Zinc ore—stockpiled.....	12,070	3.14
(b) Open-pit ore—included in copper mining area and in copper ore reserve tonnage ⁽¹⁾	71,733	3.62
(c) Open-pit ore—not included in copper ore reserve tonnage ⁽²⁾	53,522	3.14
(d) Ore tonnage outside open-pit limits and below projected pit bottom..	387,275	4.28
(e) B Zone tonnage—included in copper ore reserve tonnage.....	286,199	2.88
Total.....	810,799	3.55

¹⁾Tonnages in categories (b) and (e) will be mined as copper ores and milled for recovery of both copper and zinc.
²⁾Tonnages shown under categories (c) and (d) will be mined from underground or open pit in the future, stockpiled and blended with copper ores for mill feed. These tonnages contain a very low copper content.

The average number of employees was 86: 20 in the open pit, and 66 on surface. G. W. Walkey was mine manager.

Nickel Mining and Smelting Corporation

Eastern Mining and Smelting Corporation Limited was incorporated in December 1955. It is an amalgamation of Eastern Smelting and Refining Company Limited and Quebec Nickel Corporation Limited. The name was changed

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to Nickel Mining and Smelting Corporation; the authorized capitalization was increased to 8,500,000 shares of no par value, of which 5,387,082 shares have been issued. The directors and officers were: A. W. Johnston, president and director; H. B. Hicks, vice-president, general manager, and director; T. J. Day, W. C. Campbell, Eliot Janeway, and Robert Lafleur, directors; William McKee, secretary; W. M. O'Shaughnessy, treasurer. The head office is at Suite 1600, 100 Adelaide Street West, Toronto 1. The mine address is Box 700, Lac du Bonnet, Manitoba.

The company owns the nickel-copper property known as the Gordon Lake mine, previously called the Quebec Nickel mine, comprising 182 claims, in the Werner Lake area, District of Kenora (Patricia Portion).

Mining operations continued throughout the year, milling from 20 September to 30 December 1962.

SHAFTS, GORDON LAKE MINE

Shaft	Claim No.	Inclination	Number of Compartments	Collar Depth	Vertical Depth from Surface
No. 1.....	K.R.L.19096	vertical	3	feet surface	feet 360
No. 2.....	K.R.L.31831	vertical	3	surface	1,817
No. 3.....	—	vertical	2	1,204	1,687

No. 2 shaft was sunk 110 feet in 1962 to a vertical depth of 1,817 feet below surface.

Development footage in 1962 consisted of 1,436 feet of drifting, 2,182 feet of crosscutting, and 5,149 feet of raising. Total footage to 31 December 1962, was as follows: 18,743 feet of drifts; 9,304 feet of crosscuts; 6,635 feet of raises. Diamond-drilling in 1962 consisted of: 58 holes, totalling 8,099 feet, from underground; 2 holes, totalling 729 feet, from surface; and 22 holes for Norpax Nickel Mines Limited, totalling 1,489 feet, from underground.

The following is taken from the company annual report for the year ending 31 December 1962:

Underground installations during the year included: a 400-ton ore-loading pocket, a spill pocket, a waste pocket, a 42-inch gauge main haulage track with trolley locomotive and 8-ton capacity cars, three mine-water sumps, two pump stations, two transformer stations, electric ventilation fans on the 1,200-foot and 1,350-foot levels, and complete hydraulic fill service lines from the mill to the stopes on the various levels.

The underground electric service lines, shaft signals, and telephone systems were completely replaced. The original 48-inch hoist and 75-foot headframe were replaced by the installation of a 72-inch hoist and 112-foot headframe. Two bottom-dump skips, one with an underslung man-cage, were installed complete with dumps into a 600-ton ore bin.

Construction

Major construction jobs completed in 1962 included the substation and power transmission line to the Caribou Falls hydro-electric plant, the mill, crusher-house, assay office, headframe and bins, hoist-house, 60-man bunkhouse, cafeteria, staffhouse, lodge, seven houses in No. 2 camp and five houses in the new townsite.

The new townsite area was cleared, and electric service lines and utility mains were installed for 5 houses and 25 trailers. The mine access road was improved and surfaced with 11,647 yards of crushed mine waste.

A concentrate off-loading ramp was built at the corporation's railway siding in Lac du Bonnet, Manitoba. A 75,000-gallon elevated water tank—with mains and sprinkler protection for the mill, assay office, crusher-house, shafthouse and headframe—was also installed.

Milling

Construction of the 700-ton per day crushing plant and concentrator continued throughout the winter, and was completed by mid-September sufficiently to crush mine-rock waste for road surfacing and to tune-up the mill on surface-dump ore.

Mill performance from 20 September to 30 December, was as follows:

		Nickel	Copper
	tons	percent	percent
Surface dump ore milled.....	17,607	0.82	0.32
Mine ore milled.....	27,563	1.43	0.56
Total ore milled.....	45,170	1.19	0.47
Concentrate produced.....	3,365.9	11.44	5.49
Average nickel recovery.....	71.4 percent improving to 78.4 percent in December		
Average copper recovery.....	87.4 percent improving to 89.0 percent in December		
Concentrator operating time.....	2,026 hours		
Crusher operating time.....	639 hours for 46,059 tons of ore 253 hours for 16,874 yards of waste rock for road surfacing		

The average number of employees was 127: 56 underground, and 71 on surface. C. D. N. Taylor was resident manager; T. W. E. Swanson was mine superintendent.

Norduna Mines Limited

Norduna Mines Limited was incorporated in January 1953, with an authorized capitalization of 3,000,000 shares of no par value, of which 1,043,860 shares have been issued. The company is controlled and financed by Falconbridge Nickel Mines Limited. The directors and officers were: H. J. Fraser, president and director; Reginald Campbell, vice-president and director; J. L. Matthews, secretary and director; A. W. Coome, treasurer and director; R. C. Mott, director. The head office is at 7 King Street East, Toronto 1. The mine address is Box 353, Falconbridge.

The property, consisting of two claims located in Falconbridge and Keno-gaming townships, District of Sudbury, is a short distance east of the Falcon-bridge plant.

The No. 1, vertical, three-compartment shaft, was sunk 134 feet in 1961 to a total depth of 859 feet below surface. The 850-foot level was established at a depth of 842 feet.

Mining of the orebody, contracted by R. F. Fry and Associates, was completed 24 October 1962, and the mine was closed. The following table gives the development work in 1962, and the total at the time of closure:

Level	Drifts		Crosscuts		Raises	
	1962	Total	1962	Total	1962	Total
	feet	feet	feet	feet	feet	feet
225-foot.....	—	590	—	480	—	213
375-foot.....	—	1,080	—	499	—	171
525-foot.....	—	1,204	—	477	—	342
700-foot.....	—	743	—	318	—	181
850-foot.....	376	589	—	318	52	52
Total.....	376	4,206	—	2,092	52	959

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Some 18 diamond-drillholes, totalling 712 feet, were completed from underground. A total of 35,821 tons of ore was hoisted and delivered to the Falconbridge mill.

There were 38 men employed by the contractor during the period of operation. R. C. Staveley was mine superintendent.

North Coldstream Mines Limited

Coldstream Copper Mines Limited was incorporated in November 1951; in April 1955 the number of shares was increased to 6,000,000; in April 1957, to 7,000,000; and in November 1957, to 8,000,000. In August 1959, the name was changed to North Coldstream Mines Limited on a one-for-four share basis; the authorized capitalization is 5,000,000 shares of no par value, of which 4,438,696 shares had been issued. The directors and officers were: W. S. Row, president and director; K. C. Gray, vice-president and director; E. T. Donaldson, L. J. Moreaux, R. V. Porritt, and N. C. Urquhart, directors; R. D. Stewart, secretary; B. C. Bone, treasurer. The head office is at 44 King Street West, Toronto. The mine address is Burchell Lake, Kashabowie, P.O.

The property comprising 103 claims, includes the old Tip Top mine. It is located in the area east of Moss township and south of Ames township, District of Thunder Bay, about 90 miles west of Fort William, and about 8½ miles by road, south of Kashabowie Station on the Canadian National Railways.

Mining and milling operations continued throughout 1962.

SHAFTS, NORTH COLDSTREAM MINE

Shaft	Claim No.	Inclination	Number of Compartments	Total Depth From Surface
No. 1 ⁽¹⁾	K.65	80°	2	feet 200
No. 2 ⁽¹⁾	K.65	Vertical	1	50
No. 3 ⁽¹⁾	K.65	Vertical	1	20
No. 4.....	K.65	Vertical	3	1,596

⁽¹⁾Sunk by former operators; not in use. Considerable lateral work was done from No. 1 shaft by former operators.

Development footage in 1962 included: 1,781 feet of drifting, 959 feet of crosscutting, and 2,826 feet of raising. Total development footages to 31 December 1962, was as follows: 15,134 feet of drifts; 8,835 feet of crosscuts; 13,487 feet of raises. Diamond-drilling in 1962 comprised: 162 holes, totalling 27,492 feet, from underground and 11 holes, totalling 3,291 feet from surface.

New equipment installed included a ball mill (300-hp. motor, Canadian Allis-Chalmers).

The following is taken from the company annual report for the year ending 31 December 1962.

Development and Mining

Development and stope preparation work on the No. 6 orebody, below the 800-foot level, has been essentially completed, and regular production has been started from this area.

A total of 323,630 tons of ore was broken in silling, stoping, and development, and 365,680 tons of ore was trammed. Of the total ore broken, approximately 40 percent was in blast-hole mining, 52 percent in shrinkage stoping, and the remainder in development and stope preparation.

Summary of Production

	1962	1961
Milled ton	364,348	332,783
Average milled daily ton	998	912
Average grade, copper percent	2.01	2.17
Copper recovery percent	94.89	94.69
Total operating time percent	91.71	89.46
CONCENTRATE GRADE		
Copper percent	27.82	27.78
Gold oz. per ton	0.127	0.125
Silver oz. per ton	2.65	2.74
Concentrate shipped ton	24,872.39	24,465.67
CONTENT OF CONCENTRATE		
Copper lb.	13,835,131	13,649,395
Gold oz.	3,137.28	3,047.11
Silver oz.	63,628	66,335

The average daily tonnage milled of 998 compares with 912, an increase of 86 tons per day, over the previous period. Operating time of the concentrator increased from 89.46 percent in 1961 to 91.71 percent in 1962. Contributing to the increased tonnage were changes in mill-liner design and composition in order to decrease liner wear; alterations resulting in increased efficiency of the air classification and bleed-off systems, and the beneficial effect of the underground crusher in coarse ore sizing.

Ore Reserves

Ore reserves at 31 December 1962, after allowing for dilution, were estimated to be 1,188,000 tons, having an average grade of 2.01 percent copper, as follows:

Level	Ore	Copper	Ore	Copper
	tons	percent	tons	percent
Surface to 800-foot	—	—	708,690	2.09
800- to 950-foot	208,130	2.12	—	—
950- to 1,100-foot	209,010	1.77	—	—
1,100- to 1,250-foot	62,170	1.51	—	—
800- to 1,250-foot	—	—	479,310	1.89
Total Reserve at 31 December 1962	—	—	1,188,000	2.01
Total Reserve at 31 December 1961	—	—	1,558,000	2.08

Included in this reserve are 150,550 tons of broken ore having an average grade of 1.93 percent copper.

The average number of employees was 188: 86 underground, and 102 on surface. L. R. Redford was manager.

Pax International Mines Limited

Pax International Mines Limited was incorporated in October 1949, with an authorized capitalization of 4,000,000 shares of \$1 par value, of which 1,013,380 shares have been issued. The company is a consolidation of International Molybdenum Mines and Pax Athabasca Uranium Mines Limited. The directors and officers were: V. N. Harbinson, president and director; J. D. Bateman, vice-president and director; Maxwell Bruce, secretary-treasurer and director; B. C. Hardy, L. A. Cerf, W. E. N. Bell, and J. I. Agnew, directors. The head office is at Suite 607, 80 Richmond Street, Toronto 1. The mine address is Matachewan.

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Pax International Mines Limited leased the property of Min-Ore Mines Limited, the name having been changed from New Ryan Lake Mines in October 1955. The copper-molybdenum prospect comprises about 513 acres in Powell township, District of Timiskaming, near the town of Matachewan.

During the first half of 1962 some 2,000 tons of ore was removed from an open pit, north of the main mine area, for mill testing; one railway car of copper concentrates was shipped. The mill was used later to process copper ore trucked from the St. Lucie Syndicate (Ethel copper mine). The water is kept pumped from the Pax International shaft and underground workings.

G. S. Welsh was manager, and eight men were employed during the period of operation.

Rio Algom Mines Limited (Pronto Division, Pater Mine)

In June 1960, Pronto Uranium Mines Limited, whose property was the Pater mine, was amalgamated under the name of Rio Algom Mines Limited. Further details are given in the Uranium section of this report under Rio Algom Mines Limited.

PATER MINE

The company's main property consists of 22 claims, and 10 lots known as the McFadden Option, in Spragge township, District of Algoma. The mine address is Algoma Mills. The No. 1 vertical shaft was sunk on the southeast quarter of section 29, Spragge township to a total depth of 2,329 feet below the collar. There are three compartments from the collar to a depth of 1,024 feet, and four compartments from this point to the bottom.

Development work in 1962 consisted of: 8,050 feet of drifting, 1,086 feet of crosscutting, and 10,178 feet of raising. Total development footage to 31 December 1962, was as follows: 19,167 feet of drifts; 3,189 feet of crosscuts; 23,345 feet of raises. Diamond-drilling in 1962 consisted of 53 holes, totalling 5,375 feet, from underground.

New construction included a house over the escape raise (12 x 8 x 8 ft.); a pumphouse (10 x 8 x 8 ft.); a building over the weigh-scales (62 x 12 x 14 ft.); settling sumps and water-storage sumps on the 9th and 12th levels with capacities of 6,090 and 12,800 gallons, respectively.

Equipment added included the following:

- 1 compressor (24 x 14.5 x 12 in., XVH-2, 1,500-cfm., Canadian Ingersoll-Rand).
- 1 air receiver (12-x 4-ft.).
- 2 pumps (8-stage, size 00, with 50-hp. motors, Mather and Platt).
- 1 furnace (model 55A-1, capacity 88,000 Btu., Clare Hecla).

A total of 258,526 tons of ore was hoisted, 256,325 tons was milled; the mill treated an average of 702 tons daily.

The following, pertaining to the Pater operation, is taken from the Rio Algom annual report for the year ending 31 December 1962:

The second year of production from this operation has been marked by improved earnings and a more substantial outlook. During the early months of 1962, mining was chiefly in the marginal upper extremities of the orebody, while development was in progress in the block between

the 6th and 12th levels. By mid-year there was notable improvement as the better ore at depth became available. Coupled with this, the increase in copper price, due to favourable Canadian-United States dollar exchange rates, resulted in an over-all performance for the year that was better than could have been foreseen.

Production

Tons of ore treated totalled 256,325 for the year, and the copper content of the concentrate produced was 8,244,349 pounds, a 16 percent increase over the previous year.

The marketing contract was renewed at the year's end, and it is expected that concentrates will be smelted and refined in Canada rather than abroad, as was the case in the previous contract.

Ore Reserves

Mining of the orebody has been completed down to the 6th level, and the ore from the 6th to the 12th levels is now fully or partially developed. Below the 12th level, five of the seven diamond-drillholes put down intersected good widths and better-than-average mine grade. The ore disclosed by this diamond-drilling, indicating the downward continuation of that being mined, is conservatively projected to the 16th level at the same tonnage and grade per level as that from the 6th to the 12th horizons.

Ore reserves as of 31 December 1962, stood as follows:

PROVEN ORE	
TONS	COPPER
304,102	percent 1.90
PROBABLE ORE	
As disclosed by underground development:	
Tons	COPPER
327,536	percent 1.70
PROBABLE ORE	
As disclosed by diamond-drilling:	
TONS	COPPER
508,208	percent 1.75

Pillar allowance, and 15 percent dilution at 0.25 percent copper, has been included in the above estimates, which result in reserves of 1,139,846 tons grading 1.78 percent copper.

Compared to the previous year, this represents a 12 percent increase in tonnage, and a 16 percent increase in copper content. Also, fully and partly developed ore has risen from 26 percent to 55 percent of the total reserves.

During the year a drift was extended 500 feet west of the ore zone on the 12th, or 2,100-foot, level. The heading followed pyrrhotite mineralization, generally carrying less than one percent copper.

Summary

Highlights are the apparent strengthening of the orebody at depth, and the implementation of a mining sequence that is well-suited to the deposit. The mill turned in a uniformly good performance, effecting 95 percent recovery, and producing 25 percent copper concentrate. An investigation is under way, which may lead to upgrading of the concentrate. Lateral exploration for further ore is indicated, and a program for this work is under study.

The mine again had an excellent safety record with no compensable injuries in six out of the twelve months. Also it won the District Improvement Trophy for the second half of 1962. There was almost no labour turnover during the year.

The average number of employees was 170: 111 underground, and 59 on surface. R. D. Lord was general manager, P. E. Young was mine manager.

St. Lucie Exploration Company Limited

St. Lucie Exploration Company Limited was incorporated in July 1962 with an authorized capitalization of 3,000,000 shares of \$1 par value of which 700,007 shares have been issued. The directors and officers were: J. P. Sheridan, president and director; A. S. Donovan, vice-president and director; R. J. Donovan, treas-

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urer and director; J. C. Donovan, director; W. J. Elliott, secretary. The head office is at 121 Richmond Street West, Toronto 1. The mine address is Elk Lake.

The St. Lucie syndicate took a three-year lease on the Ethel Copper property, consisting of thirteen claims located in James and Tudhope townships, District of Timiskaming, near Elk Lake. The syndicate in turn assigned the lease to St. Lucie Exploration Company Limited.

Mining operations were continued from 28 September to 22 December 1962. under contract by Patrick Harrison and Company Limited. Milling operations continued from 30 September to 22 December; the copper ore was trucked to the Min-Ore mill (formerly New Ryan Lake) of Pax International Mines Limited, near Matachewan. The concentrate was shipped to the Noranda smelter.

The inclined adit, driven at -20 degrees for 150 feet in 1961, was slashed to 10- by 10-foot dimensions, and extended to a length of about 350 feet. A 25-foot crosscut was driven south from the bottom of the adit, to intersect the vein from which drifts were driven east and west. Diamond-drilling consisted of eight holes, totalling 406 feet, from underground and four holes, totalling 425 feet, from surface. New construction included: an office (28 x 20 ft.), a powder house (8 x 8 ft.), an extension to the compressor and machine-shop building (28 x 6 ft.), all frame construction.

A total of 8,416 tons of ore was mined and milled. The mill averaged 105 tons per operating day.

John Lill was manager, Lucien Clouthier was foreman for Patrick Harrison and Company Limited, and there were 22 employees during the period of operation.

Sherbrooke Metallurgical Company Limited

Sherbrooke Metallurgical Company Limited was incorporated in May 1959, with an authorized capitalization of 200,000 shares of no par value, all of which have been issued. The directors and officers were: H. D. Carus, president and director; C. R. MacBrayne, vice-president and director; L. C. Pejeau, secretary-treasurer and director; J. A. Battle, A. C. Carus, E. H. Carus, T. H. McCormack A. E. Wigeland, and H. A. Gronemeyer, directors; R. C. C. Palmer, assistant treasurer and assistant secretary; Laura E. Hughett, assistant secretary; W. E. Greene, comptroller. The head office and plant are at Port Maitland, P.O. Box 220, Dunnville.

Roasting of zinc concentrates by the pelletized fluid hearth process continued throughout 1962. Calcined pellets are shipped and processed at the Meadowbrook smelter of Matthiessen and Hegeler Zinc Company.

At the end of the year both roasters were in service, after having been modified during the year to improve their operation.

Early in 1962 an additional dryer was placed in operation, and in August a re-roll drum was installed in the pelletizing circuit to improve the physical quality of the pellets. The capacity of the pellet and dust storage bins was increased. A used 25-ton diesel locomotive was purchased.

Sulphur dioxide gas from the roasters is converted to sulphuric acid in the acid plant.

A total of 90,235,340 pounds of zinc oxide (calcine) was produced in 1962.

The average number of employees was 63; R. C. C. Palmer was works manager.

The Shield Development Company Limited

The Shield Development Company Limited was incorporated in March 1926, with an authorized capitalization of 5,000,000 shares of no par value, of which 3,296,081 shares had been issued at 31 December 1961. The directors and officers were: W. S. Row, president and director; K. C. Gray, R. V. Porritt, N. C. Urquhart, and Hon. Alistair Fraser, directors; C. H. Windeler, secretary; R. G. Rudolf, treasurer. The head office is at Suite 1600, 44 King Street West, Toronto 1. The mine address is Burchell Lake.

The property comprises a 310-acre copper prospect in Moss and east of Moss township, District of Thunder Bay, in the Kashabowie area; the property is completely surrounded by the North Coldstream property.

The exploration program was continued in 1962 from the North Coldstream mine, carried out by employees of North Coldstream Mines Limited. A total of 1,879 feet of drifting, 593 feet of crosscutting, and 21 feet of raising was completed. Total development footage to 31 December 1962 was as follows: 3,070 feet of drifts; 1,027 feet of crosscuts; 21 feet of raises. Some 88 diamond-drillholes, totaling 22,170 feet, were completed in 1962 from underground and one hole, 897 feet deep, from surface. An Atlas type Q battery locomotive was purchased for use underground.

G. H. Montgomery was manager.

Temagami Mining Company Limited

Temagami Mining Company Limited was incorporated in August 1954; it was an amalgamation of Temagami Mining Company and Derosier Nickel and Copper Mines Limited. The authorized capitalization is 5,000,000 shares of \$1 par value, of which 2,992,267 shares have been issued. The directors and officers were: N. B. Keevil, president and director; C. G. MacIntosh, vice-president and director; J. L. C. Jenner, secretary and director; D. S. Brown, treasurer and director; Hon. D. R. Michener, W. H. Keith, and J. C. Perry, directors; R. A. Cranston, assistant-secretary. The head office is at Suite 1000, 11 Adelaide Street West, Toronto 1. The mine address is Timagami.

The company's holdings consist of a mineral lease on part of Timagami Island, leases on 11 other islands and 185 claims in Phyllis, Briggs, Joan, Yates, and Scholes townships, Timagami area, District of Nipissing.

Mining and milling operations continued throughout 1962.

The vertical, four-compartment No. 1 shaft, located in Phyllis township on mining lease No. 11446, was sunk 310 feet in 1962 to a total depth of 1,190 feet below the collar. The 175-, 975-, and 1,125-foot levels were established at 175.8, 983.2, and 1,125 feet, respectively.

Development footage in 1962 consisted of 1,246 feet of drifting, 202 feet of crosscutting, and 1,466 feet of raising. Total development footage, to 31 December 1962, was as follows: 16,061 feet of drifts; 3,378 feet of crosscuts; 4,493 feet of

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raises. Diamond-drilling in 1962 consisted of 288 holes, totalling 49,343 feet, from underground, and 82 holes, totalling 21,077 feet, from surface.

New construction comprised: a prefabricated home (36 x 24 ft., frame construction); and 3,900 feet of 3-inch victaulic pipe, tailings line. Added equipment included;

- 1 cage (aluminium and steel, 5 x 5.5 ft.).
- 1 air compressor (electric, capacity 1,000 cfm.).
- 1 mine hoist, single-drum (48 x 36 in.).
- 1 air hoist (model AW-80, 500-lb. pull).
- 2 slusher hoists (double-drum).
- 1 stoper drill (Jr-38).
- 1 pump (2-stage centrifugal, 750-gpm.).
- 1 sand pump (3- by 3-inch, rubber lined, SRL-C).

A total of 53,096 tons of ore was hoisted; the mill treated 52,970 tons averaging 145 tons daily.

The following is taken from the company annual report for the year ending 30 June 1962:

Mining

During the year the following orebodies were mined: No. 2 (open pit), No. 3, No. 4, No. 6, No. 6E, No. 9, No. 11, and No. 16. Mining was completed in No. 2. No. 6E was opened up and mined.

Total tonnage of ore broken during the year was 68,756.

Milling

The mill treated 54,556 tons of ore, grading 7.01 percent copper. Recovery was 98.92 percent. Contained metals in 12,336.33 tons of concentrates shipped were:

Copper	lb.	7,566,475
Gold	oz.	1,026,344
Silver	oz.	22,245.33

In the crushing plant, work started on a dust-collecting system, which was 90 percent completed by the year's end.

ORE RESERVES AS OF 30 JUNE, 1962

Orebody	Ore in Place	Grade Copper	Ore Broken	Grade Copper
	tons	percent	tons	percent
No. 3	6,000	12.0	801	8.8
No. 4	3,500	8.5	1,151	7.7
No. 6	5,000	7.5	23,205	7.0
No. 6A	10,000	7.0		
No. 6E	25,000	7.5	5,444	7.0
No. 9			1,013	5.5
No. 10	5,000	7.5		
No. 11			1,614	5.5
No. 12	5,000	7.0		
No. 15	5,000	7.0		
No. 16	1,000	7.0	218	5.0
No. 17	3,000	7.0		
Total	68,500	7.8	33,446	6.9

Total ore reserves were 101,946 tons of 7.5 percent copper.

An additional 25,000 tons of 5 percent copper ore is inferred, but is not sufficiently developed or explored to be included in the reserves.

The average number of employees was 127; 41 underground, and 86 on surface. W. P. Houston was manager, M. Leavens was mine superintendent.

Willroy Mines Limited

Willroy Mines Limited was incorporated in January 1954, with an authorized capitalization of 4,000,000 shares of \$1 par value of which 3,991,905 shares have been issued. The directors and officers were: H. W. Knight, president and director; R. T. Birks, vice-president and director; R. M. P. Hamilton, P. D. P. Hamilton, G. W. Gooderham, J. C. Perry, and H. D. Carus, directors; B. E. Martin, secretary-treasurer. The head office is at 25 Adelaide Street West, Toronto 1. The mine address is Manitouwadge.

The company holds thirty claims in Gemmell and Mapledoram townships, Manitouwadge Lake area, District of Thunder Bay, in Port Arthur Mining Division, adjoining the west boundary of the Geco property.

Operations continued throughout 1962.

SHAFTS, WILLROY MINE

	Claim No.	Inclination	Number of Compartments	Total Depth from Surface
No. 1	T.B.46933	Vertical	4	feet 2,448
No. 2	T.B.46938	Vertical	2	530

No. 1 shaft was sunk 205 feet to a total depth of 2,448 feet below surface.

The following development work was done during the year: drifting, 2,980 feet; crosscutting, 651 feet; raising, 2,711 feet. The total development footage to 31 December 1962 was as follows: 26,260 feet of drifts; 11,377 feet of crosscuts; 18,936 feet of raises. Diamond-drilling consisted of 312 holes totalling 46,540 feet from underground.

The following new plant equipment was added:

- 1 Diesel locomotive (4½-ton, used, Ruston Hornsby).
- 2 Mucking machines (model LM-250, 38-in. track-gauge, Atlas Copco).
- Mechanical and electrical equipment for double-drum hoist (8-x 66-in., John Bertram & Sons Ltd.).

A total of 496,127 tons of ore was hoisted, 495,028 tons was milled; the mill treated an average of 1,356 tons daily.

The following is taken from the company annual report for the year ending 31 December 1962.

Costs

Unit costs were reduced owing to improvements in equipment and efficiency, and also to higher tonnage treated. Developments costs remained the same, whereas mining, milling, and administration costs were all improved. A comparison of operating costs during the years 1961 and 1962 follows:

	Cost Per Ton Milled	
	1962	1961
Exploration and development	\$0.24	\$0.26
Mining	2.08	2.41
Milling	1.36	1.59
Administrative and general	0.83	0.92
Total	\$4.51	\$5.18

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Mining

Underground operations during 1962 were highlighted by the start of primary crushing underground, along with the enlarged use of heavier mucking equipment and better grade control. In order to meet schedules incorporating an 18 percent increase in tonnage, a new complex of crusher station, loading pocket, and ore passes had to be completed; this was done early in the year.

While the same general mining system was used, stope draw was improved by the use of larger loaders. Also grade control was greatly aided by the development of stressed bolts as a device to hold the hanging wall.

Milling

During 1962 copper metallurgy improved slightly despite higher tonnage treated, while zinc and silver recoveries were lower. Contained lead in the mill heads declined steadily as in previous years until, finally, the point was reached where it was not economic to make a lead concentrate. The lead circuit, therefore, was shut down in June, and the involved flotation cells were diverted to copper cleaning.

Average milling results as compared to 1961 follow:

AVERAGE MILLING RESULTS, 1962

Average daily tonnage—1,356 tons: mill running time 95.42 percent of total

	Assays				Recoveries			
	Ag	Cu	Pb	Zn	Ag	Cu	Pb	Zn
Heads.....	1.43	1.70	0.14	5.56	100.0	100.0	100.0	100.0
Cu concentrate....	12.41	23.40	0.76	6.11	55.8	88.3	25.7	7.1
Pb concentrate....	80.44	9.55	40.84	4.67	7.4	0.7	67.1	0.1
Zn concentrate....	1.43	0.74	0.03	54.16	8.4	3.7	2.1	81.8
Tails.....	0.48	0.14	0.01	0.72	28.4	7.3	5.1	11.0
Payable Recoveries.....					63.2	89.0	67.1	81.8

AVERAGE MILLING RESULTS, 1961

Average daily tonnage—1,156 tons: mill running time 95.86 percent of total

	Assays				Recoveries			
	Ag	Cu	Pb	Zn	Ag	Cu	Pb	Zn
Heads.....	1.74	1.34	0.21	6.68	100.0	100.0	100.0	100.0
Cu concentrate....	20.57	24.03	0.92	7.24	57.1	87.1	21.7	5.2
Pb concentrate....	60.80	7.09	48.28	5.03	10.8	1.6	72.3	0.2
Zn concentrate....	1.23	0.56	0.02	54.82	7.4	4.4	1.2	86.3
Tails.....	0.51	0.11	0.01	0.62	24.7	6.9	4.8	8.3
Payable Recoveries.....					67.9	88.7	72.3	86.3

General

Copper shipments were directed as usual to Noranda. Zinc concentrates were shipped to Port Maitland, Josephstown, Palmerton, and Europe. Lead concentrates went to East Helena until June, when lead shipments were discontinued.

Several improvements and additions to the town of Manitouwadge have been completed during the year under review, and these have had a beneficial effect on personnel. These include paving, street lighting, schools, and medical facilities.

The Willroy Mine Rescue team won the Provincial Mine Rescue Competitions held in Atikokan in June and were awarded the Ontario Championship.

Accident frequency for the year was reduced to a record low of six per million man-hours.

Ore Reserves

As of 1 January 1963, the total of broken, proved, and indicated reserves stood at 2,002,900 tons, distributed as follows:

Zone	Total Ore	Averages			
		Copper	Zinc	Lead	Silver
	tons	percent	percent	percent	ounces
No. 1.....	572,487	1.39	0.45	—	0.42
No. 2.....	79,148	0.02	5.33	—	0.34
No. 3.....	1,011,753	1.94	4.62	0.06	1.36
No. 4.....	44,255	0.03	7.71	1.33	4.90
No. 5.....	77,170	0.03	7.52	0.19	2.07
No. 6.....	218,087	2.38	1.28	trace	0.93
Total or Average.....	2,002,900	1.64	3.27	0.07	1.11

The average number of employees was 233: 113 underground, and 120 on surface. R. S. Hafidson was manager.

PLATINUM METALS—see NICKEL AND COPPER

SELENIUM—see NICKEL AND COPPER

SILVER AND COBALT

In 1962 the mines of the Cobalt and Gowganda areas shipped 4,933 tons of concentrates to Noranda Mines Limited and 716 tons to Cobalt Refinery. They shipped 750 tons of concentrates to refineries in the United States. From this total of 6,399 tons, 4,707,590 ounces of silver were recovered. In the refining of concentrates from the base metal mines, 2,520,807 ounces were recovered; in the refining of concentrates from the nickel-copper mines, 1,757,848 ounces were recovered, and 397,200 ounces were recovered in the refining of concentrates from the gold mines. The total of 9,383,445 ounces is a gain of 5.78 percent in quantity, and the value is a gain of 30.73 percent over 1961. The average price of silver in 1961 was 94.26 cents per ounce; in 1962 it was 116.47 cents per ounce.

The mines of the Cobalt-Gowganda area reported the recovery of 39,161 pounds of cobalt from ores and concentrates shipped. The refining of nickel-copper ores yielded 2,610,032 pounds. The total of 2,649,193 pounds was valued at \$4,765,808. This is a decrease of 8.16 percent in quantity and an increase of 10.58 percent in value compared with the 1961 production.

The mines of the Cobalt-Gowganda area paid \$384,497 to 80 salaried employees, and \$2,096,851 to 494 wage-earners. Fuel and electricity cost \$333,753, and process supplies cost \$428,766.

SILVER PRODUCTION

Source	1958	1959	1960	1961	1962
Sales of bullion by the reduction companies, smelters, and mines. Contained in silver-cobalt concentrates exported from Canada. Estimated as recovered from concentrates treated in other provinces.	oz. \$ 6,043,502 5,257,847	6,657,162 5,843,657	7,155,909 6,362,319	4,680,763 4,412,087	4,707,590 5,484,342
In crude gold bullion	oz. \$ 442,249 380,951	408,114 358,242	442,629 393,541	404,693 381,463	397,200 462,738
Recovery for nickel-copper refineries	oz. \$ 1,217,510 1,056,920	1,384,223 1,215,071	1,665,314 1,480,631	1,785,643 1,683,147	1,757,848 2,047,893
Base metal mines	oz. \$ 2,111,996 1,833,424	2,091,357 1,835,793	1,956,971 1,739,943	1,999,303 1,884,543	2,520,807 2,936,740
Total Production	oz. 9,815,257	10,540,856	11,220,823	8,870,402	9,383,445
Total Value	\$ 8,529,142	9,252,763	9,976,434	8,361,240	10,931,713

SHIPMENTS FROM SILVER MINES, SMELTERS, AND REFINERIES

Year	Bismuth	Copper	Lead	Nickel	Cobalt	Arsenic	Silver	Total
1904-1957	123 283,749	1,642 731,524	412 42,298	7,958 3,629,153	21,309 48,921,791	85,068 7,005,383	oz. 474,531,000 291,686,908	352,300,806
1958	9 26,779	113 57,340	34 4,661	79 119,896	379 1,506,783	1,162 94,542	oz. 6,043,000 5,257,847	7,067,848
1959	16 37,748	92 54,645	63 8,559	89 133,562	277 962,653	789 63,786	oz. 6,657,000 5,843,657	7,104,610
1960	19 45,402	136 82,304	74 12,297	64 130,467	170 616,713	862 70,400	oz. 7,155,909 6,362,319	7,319,902
1961	10 22,388	92 53,643	27 5,445	44 63,107	48 162,572	210 16,772	oz. 4,680,763 4,412,087	4,736,014
1962	— —	38 23,740	— —	6 10,493	20 58,742	80 6,832	oz. 4,707,590 5,484,342	5,584,149
Total	177 416,066	2,113 1,003,196	610 73,260	8,240 4,086,678	22,203 52,229,254	88,171 7,257,715	oz. 503,775,262 319,047,160	384,113,329

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Agnico Mines Limited

Cobalt Consolidated Mining Corporation Limited was incorporated in January 1953; in October 1957 the company was reorganized, and the name was changed to Agnico Mines Limited. The capitalization was increased to 5,000,000 shares of \$1 par value, of which 2,332,327 shares have been issued. The directors and officers were: J. F. Paxton, president and director; George Scott, secretary-treasurer and director; R. D. Bell, assistant secretary-treasurer and director; H. E. Cawley, L. G. Smith, L. G. Phelan, and W. E. McLean, directors. The head office is at Suite 405, 25 Adelaide Street West, Toronto 1. The mine address is Box 140, Cobalt.

The company has acquired properties formerly held by Silanco Mining and Refining Company Limited; Cobalt Lode Silver Mines Limited; Penn-Cobalt Silver Mines Limited; Gilgreer Mines Limited; Keylode Cobalt Silver Mines Limited; Hellens Mining and Reduction Company Limited; and others in the Cobalt, South Lorrain, and Gowganda areas, District of Timiskaming. A group of mines in Coleman township, including the Beaver and Temiskaming mines, was acquired in 1955, and the O'Brien mine in 1958. The company also owns, or has an interest in, a number of claims in the Blind River area, District of Algoma, and in Strathcona township, District of Nipissing.

All mining operations in 1962 were confined to the company's properties in the Cobalt area.

BRADY LAKE PROPERTY

The Brady Lake property, which has also been called the Silver-Miller mine, is in lots 2 and 3, concession III, Coleman township. It includes six claims comprising the old Lumsden, Rochester, Gillies, Cobalt Central, and Coleman Development (Pan Silver) mines.

The property, which adjoins the Christopher property on the north, was leased from Silver-Miller and a development program was commenced.

Mining operations continued from January to August 1962.

SHAFTS, BRADY LAKE PROPERTY

	Location	Inclination	Number of Compartments	Collar Depth	Vertical Depth from Surface
No. 1 shaft (Lumsden)	Claim No. 367	Vertical	2	feet	feet
No. 2 shaft (Rochester)	Claim No. 119	Vertical	2	—	400
No. 3 shaft (Rochester)	Claim No. 119	Vertical	2	—	75
No. 4 shaft (Pan Silver)	SW $\frac{1}{4}$, N. $\frac{1}{2}$, lot 2, con. III Coleman twp.	Vertical	2	—	75
No. 1 winze (Pan Silver)	—	Vertical	2	—	632
No. 3 winze (Pan Silver)	—	Vertical	2	285	447
No. 4 winze (Lumsden)	—	Vertical	2	610	746
				200	270

The following table gives the development footage in 1962 and the totals when operations were suspended in August 1962.

Level	Drifts		Crosscuts		Raises		Subdrifts	
	1962	Total	1962	Total	1962	Total	1962	Total
	feet	feet	feet	feet	feet	feet	feet	feet
100-foot.....	—	549	—	165	—	—	—	—
175-sublevel.....	—	420	—	—	—	—	—	—
180-foot.....	—	270	—	—	—	—	—	—
200-foot.....	—	629	—	135	—	—	—	—
225-sublevel.....	—	783	—	—	—	—	—	—
225 A-sublevel.....	—	223	—	—	—	—	—	—
250-foot.....	—	1,049	—	—	—	50	—	—
285-foot.....	—	8,359.3	—	1,422.5	—	2,256.2	—	—
300-foot.....	—	102	—	—	—	—	—	—
360-foot.....	—	1,621.2	—	14.5	—	315	—	—
400-sublevel.....	—	71	—	—	—	—	—	—
410-foot.....	—	568.5	—	—	—	140	—	—
440-foot.....	—	4,291.2	—	374.3	105	1,442.6	32	67.5
500-foot.....	—	6,356.5	—	2,067	239	3,325.3	43	43
560-foot.....	25	2,198.1	—	—	—	492.5	—	—
610-foot.....	—	2,543.8	—	3,073.1	76	1,675.1	22.5	34
675-foot.....	—	1,129.7	—	225.8	—	159	—	—
725-foot.....	—	874.6	—	28	—	339	—	—
Total.....	25	32,038.9	—	7,505.2	420	10,194.7	97.5	144.5

Some 25 diamond-drillholes, totalling 3,790 feet, were drilled from underground.

A total of 1,440 tons of ore was hoisted and milled.

CHRISTOPHER PROPERTY

The Christopher mine adjoins the south boundary of the Cobalt Lode mine, in lot 2, concession III, Coleman township.

SHAFTS, CHRISTOPHER MINE

	Claim No.	Inclination	Number of Compartments	Collar Depth	Vertical Depth from Surface
				feet	feet
No. 1 shaft.....	1970	Vertical	2	—	295
No. 2 shaft.....	106	Vertical	2	—	415
No. 650 winze.....	—	Vertical	2	556	622

The Cobalt Lode and Christopher shafts are connected on the 400-foot level, and the nearby Brady Lake No. 4 shaft, leased from Silver-Miller, connects with the Cobalt Lode shaft on the 600-foot level. Mining operations throughout 1962 were on the Christopher property with ore hoisted in all three shafts.

Development work during the year included: 1,674 feet of drifting, 63 feet of crosscutting, and 1,594 feet of raising. Total development footage, to 31 December 1962, was as follows: 13,990 feet of drifts; 4,342 feet of crosscuts; 11,237 feet of raises. Diamond-drilling in 1962 consisted of 66 holes, totalling 11,817 feet, from underground.

A mine repair shop (25 x 20 ft.) was moved from the Brady Lake property to the Christopher mine.

A total of 38,453 tons of ore was hoisted and milled.

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VIOLET PROPERTY

The Violet property, comprising about 40 acres, is located to the south of the O'Brien property.

Operations were continued from January to May 1962.

SHAFTS, VIOLET PROPERTY

	Location	Inclination	Number of Compartments	Collar Depth	Total Depth from Surface
No. 2 shaft	NW.¼, S.½, lot 3, con VI, Coleman twp.	Vertical	2	feet	feet
Winze, 690-foot level	—	70°	2	690	705
Winze, 410-foot level	—	Vertical	2	410	920 610

A connection, via old workings, was made to the lower levels of the adjoining O'Brien mine. Development work on the 635-foot level in 1962 consisted of 45 feet of drifting, 179 feet of crosscutting, and 14 feet of raising; when some 30 feet of crosscutting on the 350-foot level, for a pumping station completed in 1961, is added, this is the total to 31 December 1962. Some six diamond-drillholes, totalling 1,354 feet, were completed from underground in 1962.

O'BRIEN PROPERTY

Nipissing-O'Brien Mines Limited was incorporated in January 1952. The company acquired the properties of M. J. O'Brien Limited, and Nipissing Mines Company Limited, in concessions V and VI, Coleman township, District of Timiskaming.

Nipissing-O'Brien Mines Limited operated the property until June 1958, when it was purchased by Agnico Mines Limited. Mining operations continued at the O'Brien mine throughout 1962.

SHAFTS, O'BRIEN MINE

	Location	Inclination	Number of Compartments	Collar Depth	Depth from Surface
Main shaft	R.L.403	Vertical	3	feet	feet
No. 2 shaft	R.L.403	Vertical	2	—	345
No. 6 shaft	R.L.403	Vertical	2	—	250
No. 14 shaft	R.L.403	Vertical	2	—	300
No. 615 winze	—	Vertical	2	340	176 460

Operations are carried on through the main shaft to the 340-foot level, and through No. 615 winze to the 460-foot level.

Development work in 1962 consisted of 866 feet of drifting, 521 feet of subdrifting, and 888 feet of raising. Total development footage to 31 December 1962 was as follows: 7,681 feet of drifts; 3,358 feet of subdrifts; 2,109 feet of crosscuts; 8,632 feet of raises. Some 121 diamond-drillholes, totalling 17,600 feet, were completed in 1962, from underground.

A total of 27,264 tons of ore was hoisted and milled.

The following is taken from the company annual report for the year ending 31 December 1962:

Mining Operations

Property	Ore Broken		Ore Hoisted		Waste Hoisted
	Stoping	Development	Stoping	Development	
	tons	tons	tons	tons	tons
Brady.....	1,073	413	1,393	47	79
Christopher.....	23,776	3,606	38,023	430	3,017
O'Brien.....	23,566	4,106	25,083	2,181	61
Violet.....					
Total.....	48,415	8,125	64,499	2,658	3,338

Milling and Production

Agnico Mill	Milled	Type of Concentrate	Concentrate Recovered	Silver	Cobalt	Copper	Nickel
			tons	ounces	pounds	pounds	pounds
Silver ore....	66,195	Gravity Flotation	138	362,037	19,778	1,596	2,596
High-grade recovered			1,915	407,843	40,645	73,558	13,452
	—	—	21	131,278	1,104	129	63
Total....	—	—	2,074	901,158	61,527	75,283	16,111

During the year the calculated mill head was 12.78 ounces per ton, and the average silver recovery was 90.92 percent. The mill operated a total of 286 days, averaging 231 tons daily.

The gradual increase in the price of silver to a high of \$1.30 per ounce at the year's end, allowed the company to show a small operating profit.

Milling

During 1962 the concentrator processed 66,195 tons.

The installation of a new four-foot Symons cone-crusher in January has greatly increased the economy and efficiency of the crushing plant.

High-grade concentrates were shipped to American Smelting and Refining Company, and the low-grade concentrates to Noranda.

Ore Reserves

As in previous years, tonnages of suitable ore grade are available for milling as required.

Estimation of ore in place is not considered reliable on account of the variations in assay values and mineable widths.

The average number of employees at all operations was 123: 64 underground, and 59 on surface. G. D. Wilson was manager.

Alsof Mines Limited

Alsof Mines Limited was incorporated in June 1957, with an authorized capitalization of 4,000,000 shares of \$1 par value, of which 1,105,440 shares have been issued. The directors and officers were: R. R. Coggan, president and director; M. G. Clarke, vice-president in charge of operations and director; L. F. Winchell, secretary-treasurer and director; M. W. Tedford, and W. G. Gardiner, directors. The head office is at Suite 2001, 80 King Street West, Toronto 1. The mine address is c/o General Delivery, Elk Lake.

Alsof Mines Limited purchased the former Mapes-Johnson silver property comprising seven claims southwest of Elk Lake in Mickle township, District of Timiskaming. Former operators had sunk the vertical, two-compartment Mapes-Johnson shaft located in claim MR.423 to a depth of 208 feet below the collar.

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A vertical, two-compartment winze, collared on the 200-foot level, extended down for 176 feet to a vertical depth of 376 feet below surface. Levels had been established at depths of 65, 100, 200, 265, 300, and 370 feet. A total of 820 feet of drifts, 35 feet of crosscuts, and 98 feet of raises had been completed.

Alsof Mines Limited commenced dewatering the shaft in October 1962. Surface-trenching, some 100 feet in length and averaging 4 feet in depth, was completed.

New construction included a compressor and mine dry building (24 x 30 ft., frame construction with insul board siding).

Fred Walsh was mine superintendent, and four men were employed during the period of operation.

Cobalt Refinery Limited

Cobalt Refinery Limited was incorporated in June 1962, with an authorized capitalization of 1,000,000 shares of no par value, of which 600,007 shares have been issued. The directors and officers were: A. W. White, president and director; C. H. E. Stewart, vice-president and director; L. V. Barbisan, K. J. Benner, and W. A. Edmond, directors; H. R. Heard, secretary; J. Geddes, treasurer. The head office is Suite 416, 25 Adelaide Street West, Toronto 1. The plant address is R.R. No. 1, Cobalt.

The treatment plant is located 6 miles south of Cobalt and $\frac{1}{2}$ mile east of highway No. 11. It was formerly owned by Coballoy Mines and Refiners Limited; after being idle for several years was taken over by J. J. Gray in May 1961. Cobalt Refinery Limited purchased the plant, 30 June 1962.

The production of silver bullion and refined arsenic was intermittent during the first half of the year, but as new silver properties in the area began producing, increased amounts of concentrates and metalics were received at the plant. Continued improvements in the smelting end of the circuit has shown that up to 200 tons of concentrates per month can be treated. The cobalt plant, in which the speiss product from the smelter is treated became fully operative. Wet-separation methods recover the contained metals and silver in the speiss, and the first production of oxides of cobalt and nickel of a readily marketable grade were produced in March.

The plant is being converted from a combination of coal, coke, and light fuel oil to natural gas. A new automatic gas boiler was installed. A new arsenic refinery was built and commenced operation. Needed equipment was purchased from Deloro Smelting and Refining Company Limited.

The production for 1962 is given in the following table from 1 January to 30 June, and from 1 July to 31 December 1962, to coincide with the change in ownership.

	Cobalt Refinery Ltd. 1 January-30 June 1962	Cobalt Refinery Ltd. 1 July-31 December 1962
Silver.....oz.	324,134	524,520
Cobalt (oxide).....lb.	5,483	20,998
Nickel (oxide).....lb.	5,693	7,610
Arsenic (refined).....lb.	115,400	89,600
Copper (crude).....lb.	2,264	3,600

The average number of employees was 43: J. N. Cram was resident manager throughout 1962.

Deer Horn Mines Limited

Deer Horn Mines Limited was incorporated in December 1950, with an authorized capitalization of 5,000,000 shares of \$1 par value, of which 4,285,005 shares have been issued. The directors and officers were: Denison Denny, president and managing director; J. G. Pierdon, vice-president and director; P. A. Chubb and J. D. Smith, directors; Lawrence Murphy, treasurer; Miss Margaret B. Smith, secretary. The head office is at Suite 1010, 100 Adelaide Street West, Toronto 1. The mine address is Box 739, Cobalt.

Deer Horn Mines Limited leased the Cross Lake O'Brien property from Agnico Mines Limited. The property consists of fourteen claims in Coleman township, District of Timiskaming, about 1½ miles east of Cobalt.

The mine, and mill operated throughout 1962.

The main shaft has a total depth of 645 feet below surface. There are two winzes, one of which extends to a depth of 800 feet below surface. A total of 837 feet of drifting, 202 feet of crosscutting, and 1,807 feet of raising was completed in 1962. Total development footage to 31 December 1962 was as follows: 42,191 feet of drifts; 13,795 feet of crosscuts; 8,426 feet of raises. Some 219 diamond-drill-holes, totalling 23,017 feet, were drilled from underground.

The former Nipissing O'Brien mill, a 100-ton per day concentrator comprising crushing, grinding, gravity, and flotation concentration, was used.

A total of 22,206 tons of ore was hoisted; 657 tons was discarded; 22,022 tons was milled. The mill averaged 85 tons daily.

The average number of employees was 57: 33 underground, and 24 on surface. J. E. Armstrong was mine manager, and H. G. Neilson was mill superintendent.

Glen Lake Silver Mines Limited

Glen Lake Silver Mines Limited was incorporated in June 1960, with an authorized capitalization of 5,000,000 shares of \$1 par value, of which 2,700,005 shares had been issued to 31 December 1961. The directors and officers were: G. E. Buchanan, president and director; R. J. Murphy, vice-president and director; Frank Cadesky, secretary-treasurer and director; R. J. Juby and A. J. Fortens, directors. The head office is at 100 Adelaide Street West, Toronto 1. The mine address is Box 590, Cobalt.

The property, formerly known as the Bailey mine, comprises about 58 acres in Coleman township, District of Timiskaming. It is located on the north side of Glen Lake, across from the Foster mill. The vertical, two-compartment No. 1 shaft, located on the southwest quarter of the north half of lot 4, concession IV, Coleman township, had been sunk to a depth of 283 feet, by former operators. There are five levels including the adit level off the shaft.

Mining operations progressed from 3 January to 31 December 1962. Milling commenced on 7 July 1962, the mill operated for the remainder of the year.

Development work included: 620 feet of drifting, 935 feet of crosscutting, and 83 feet of raising. Total development footage to 31 December 1962 was as follows: 2,850 feet of drifts; 3,347 feet of crosscuts; 230 feet of raises. Diamond-drilling in 1962 consisted of 74 holes, totalling 13,243 feet, from underground and 17 holes, totalling 8,835 feet, from surface.

New construction in 1962 included: a mill building (100 x 40 ft.); an office, dry and warehouse building; an electrical shop; a machine shop and corelogging building.

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New equipment was installed in the substation, mine, and mill as follows:

Substation:

- 3 transformers (300-kva).
- 3 panels for above.

Mine:

- 1 electric hoist (48 x 36 in., Canadian Ingersoll-Rand), on surface.
- 1 aluminum cage (for 4-x 4-ft. shaft).
- 1 coarse-ore bin and grizzly, on surface.

Mill:

- 1 jaw-crusher (15 x 24 in. Canadian Allis-Chalmers).
- 1 cone-crusher (22-in. standard, Symons).
- 1 screen (3-x 6-ft., Dillon).
- 2 fine-ore bins (150-ton capacity).
- 1 ball mill (5-x 5-ft., Canadian Allis-Chalmers).
- 1 ball mill (5-x 5-ft., Beatty-Welland).
- 2 mineral jigs (Denver Duplex).
- 1 classifier (5-x 22-ft., Aiken).
- 5 pumps (three, S.R.L. 4-in.; two, S.R.L. 2-in., Denver).
- 2 concentrating tables (17.5 x 7 ft., Deister).
- 1 conditioner (5-x 6-ft., Denver).
- 2 banks flotation cells (one of 2 No. 24, one of 6 No. 18, Denver).
- 1 thickener tank (8-x 12-ft.).
- 1 string filter (3-x 4-ft., Soo Foundry).
- 1 vacuum pump (9-x 5-in., Canadian Ingersoll-Rand).
- 2 concentrate dryers (one worm-feed type, one plate type).
- 1 sump pump (2-in.).

A total of 13,788 tons of ore was hoisted; 12,813 tons was milled, at an average of 74 tons daily.

The average number of employees was 47: 28 underground, and 19 on surface. M. C. Halstead was manager.

Hespanola Mines Limited

Hespanola Mines Limited was incorporated in October 1956, with an authorized capitalization of 6,000,000 shares of \$1 par value, of which 1,000,005 shares have been issued. The directors and officers were: F. F. Henry, president and director; H. W. Morris, secretary-treasurer and director. The head office is at Room 808, 55 York Street, Toronto 1. The plant address is Box 115, North Cobalt.

The old Colonial mill building, located in Coleman township, east of Cross Lake, District of Timiskaming, was taken over by Hespanola Mines Limited, and a plant to recover silver values from tailings was installed. The process employed was wet-gravity separation using units designed and patented by C. J. Duseling. The plant had a capacity of 200 tons per day, when completed. Several weeks of tuning-up the equipment followed, using tailings from local areas.

The plant had operated from October to 16 November making test runs, when it was completely destroyed by fire. Plans are to rebuild the plant in 1963.

C. F. Morgan was superintendent, and eight men were employed during the period of operation.

Keeley-Frontier Mines Limited

Keeley-Frontier Mines Limited was incorporated in September 1959 with an authorized capitalization of 5,000,000 shares of \$1 par value, of which 4,432,360 shares have been issued. The directors and officers were: M. C. Mosher, president

and director; F. H. Todd, vice-president and director; C. R. Archibald, secretary-treasurer and director; R. J. Ash, R. J. Murphy, and H. Van Smith, directors. The head office is at Suite 1003, 67 Yonge Street, Toronto 1. The mine address is Cobalt, Box 339.

The company acquired the old Keeley and Frontier properties, comprising 12 claims, approximately 380 acres, at Silver Centre in South Lorrain township, District of Timiskaming, about 20 miles south of Cobalt. The two properties, which adjoin, had a very successful early production history. Current efforts by the company were concentrated on the Frontier property, although the Keeley workings were dewatered to the 8th level through the Frontier underground.

Operations progressed from 31 January to 31 December 1962.

SHAFTS, KEELEY-FRONTIER MINE

	Claim	Inclination	Number of Compartments	Total Depth from Surface
FRONTIER PROPERTY				feet
No. 1 shaft	H.R.16	Vertical	2	376
No. 2 shaft	H.R.16	Vertical	2	62
No. 3 shaft	H.R.16	Vertical	3	627
Crompton	H.R.25	Vertical	2	40
No. 8 winze (collared at 540 feet)	—	Vertical	2	1,360
No. 9 winze (collared at 1,360 feet)	—	Vertical	2	1,455
KEELEY PROPERTY				
No. 1 shaft	H.R.19	Vertical	2	240
No. 2 shaft	H.R.19	Vertical	2	100
No. 3 shaft	H.R.19	Vertical	2	570
No. 4 shaft	H.R.21	60°	2	—
No. 828 winze (collared at 560 feet)	—	Vertical	3 and 2	825
No. 830 winze (collared at 560 feet)	—	Vertical	1 and 2	705

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All necessary equipment for a 200-ton per day mill including jaw-crusher, cone-crusher, ball mill, classifier, flotation cells, thickener etc., was installed. Milling is scheduled for early 1963, with material coming from the Frontier underground and from a large surface dump.

The average number of employees was 50: 24 underground, and 26 on surface. Roger Gareau was manager.

Langis Silver and Cobalt Mining Company Limited

Langis Silver and Cobalt Mining Company Limited was incorporated in February 1953, with an authorized capitalization of 300,000 shares of \$1 par value; in 1957 the capitalization was increased to 5,000,000 shares, of which 3,800,015 have been issued. The directors and officers were: A. W. White, president and director; R. A. Halet, vice-president and director; K. J. Benner, David Burt, and J. E. Armstrong, directors; H. R. Heard, secretary-treasurer. The head office is at Suite 416, 25 Adelaide Street West, Toronto 1. The mine address is New Liskeard.

The property consists of twenty claims in Casey and Harris townships, District of Timiskaming, and includes the former Casey Cobalt property.

Mining and milling operations continued throughout 1962.

SHAFTS, LANGIS SILVER PROPERTY

	Claim No.	Inclination	Number of Compartments	Total Depth from Surface
No. 1 shaft (inactive).....	T. 354	75°	2	feet 270
No. 3 shaft.....	T. 354	Vertical	2	372
No. 4 shaft (inactive).....	T.1474	Vertical	2	150
No. 6 shaft.....	T.1110	Vertical	2	411
No. 4 winze (below 260-foot level) ..	—	Vertical	2	310

Development work consisted of 3,401 feet of drifting, 936 feet of crosscutting, and 997 feet of raising. Total development footage to 31 December 1962 was as follows: 19,953 feet of drifts; 16,823 feet of crosscuts; 4,796 feet of raises. Diamond-drilling in 1962 consisted of 201 holes, totalling 19,234 feet, from underground.

The following is taken from the company annual report for the year ending 31 December 1962:

Development

The total linear footage of ore developed at 1,276 feet, was unchanged from the previous year and represents 37 percent of the drift advance. Emphasis was placed on developing ore at No. 6 shaft rather than No. 3 shaft. Efforts were rewarded in finding ore in the diabase for the first time. The upward extension of No. 30 vein was encountered in diabase by a flat drillhole from near the station on the 275-foot level, No. 6 shaft. Shortly afterwards, and near the year's end, good ore was encountered in a raise on the same vein in diabase, 200 feet south of the drillhole intersection. These discoveries led to the re-opening of the 275-foot level—abandoned for more than 40 years.

Three diamond-drills were kept in operation underground during the year, completing 19,234 feet. No effort was made to outline ore below the present bottom levels in either shaft.

Ore Reserves

The spectacular rise in the price of silver, and better marketing conditions, has allowed several low-grade veins to be re-worked profitably.

Special efforts will be made in 1963 to investigate ore possibilities in the underlying Keewatin rocks and the overlying diabase. Both these formations have been neglected in the past.

The total broken ore as reserves was increased this year to 6,193 tons.

Production

By the year's end, all concentrates were being shipped to Canadian smelters for treatment with the bulk to the Cobalt Refining Limited, where payment is made for the cobalt content as well as silver and copper.

The estimated gross value of silver and other metals produced amounted to \$789,130.80, compared to \$672,644.89 in 1961. The net estimated smelter value was \$702,489.67 to net a profit of \$95,674.81 before provision for write-off allowances. With better silver prices, the net average smelter return was \$1.09 per ounce, compared to \$0.82 last year.

	Per Ton Ore Treated	
	1962	1961
Development	\$ 6.17	\$ 7.69
Mining	5.60	6.10
Ore treatment	3.12	4.29
Mine office and management	0.76	0.93
General account	0.17	0.34
Total Operating Cost	\$15.82	\$19.35

There was little change in the total operating expenses for the year in spite of a shorter work week. Reduction of \$3.53 in the cost per ton of ore treated resulted from increased milling rate.

Surface Exploration

There was no surface exploration completed in 1962. However, there are areas surrounding mine workings that offer excellent chances of enlarging the ore potential of the mine, especially with the improved metal prices.

Finding ore in diabase suggests an excellent exploration area east of No. 6 shaft, where 10 claims are suspected of being underlain by this formation.

Milling

At a milling rate of 100 tons per day, the mill operated very satisfactorily, treating 36,750 tons.

Mill heads were lower at 19.3 ounces. However, on account of the higher tonnage treated, the total ounces of silver produced was only slightly lower than the previous year. Due to improved silver prices, the net smelter return per ton of ore treated was \$19.12, compared to \$19.15 in 1961.

	1962	1961
Milled	36,750	29,434
Average per day	100.68	81.35
Mill heads per ton silver	19.3	25.32
Silver produced	647,003	687,828
Calculated recovery	92.62	93.96

The cost of milling was reduced \$1.17 per ton to \$3.12.

The average number of employees was 82: 65 underground, and 17 on surface. J. E. Jerome was mine manager.

Larum Mines Limited

Larum Mines Limited was incorporated in January 1953, with an authorized capitalization of 3,000,000 shares of \$1 par value, of which 2,050,005 shares have been issued. The directors and officers were: J. M. Macintosh, president and director; E. C. MacLeod, vice-president and managing director; W. W. Dennis, M. C. Mosher, and A. B. Whitelaw, directors; W. M. Macintosh, secretary-treasurer; R. J. McDonell, assistant secretary-treasurer. The head office and mine address is Room 906, 357 Bay Street, Toronto 1.

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The property, consisting of mining claim R.L.471 at Silver Centre in South Lorrain township, District of Timiskaming, adjoins the Keeley-Frontier property on the northeast and is readily accessible by highway. There are 2, one-compartment shafts on the property, the deeper inclined No. 1 shaft, 95 feet deep, was pumped out and sampled. Surface-trenching, some 200 feet in length, and averaging 6 feet in depth, was completed on a showing east of the shaft. A core shed (16 x 12 ft.) was constructed, and surface diamond-drilling is planned.

E. L. McVeigh was consulting engineer, L. R. Berry was field engineer; four men were employed during the period of operation.

Majortrans Oil and Mines Limited

Majortrans Oil and Mines Limited was incorporated in January 1957, with an authorized capitalization of 15,000,000 shares of no par value, of which 9,565,000 shares have been issued. The directors and officers were: W. G. Wood, president and director; W. D. MacLean, vice-president and director; J. Ross, secretary-treasurer and director; C. W. Walker and D. H. Gorman, directors. The head office is at 4th floor, 244 Bay Street, Toronto 1. The mine address is Elk Lake.

The property, formerly known as the Otisse Silver, comprises twenty-six claims in Mickle township, District of Timiskaming, near Elk Lake. Former operators had sunk a vertical, two-compartment shaft on claim No. 224, 160 feet below the collar with levels established at 75- and 150-foot depths. On the 75-foot level, 755 feet of drifting and 240 feet of crosscutting had been completed; on the 150-foot level, 230 feet of drifting and 130 feet of crosscutting had been completed.

The present company operated from 10 October to 31 December 1962.

Development work consisted of 12 feet of raising on the 75-foot level. Total development to 31 December 1962 consisted of 985 feet of drifts, 370 feet of crosscuts, and 12 feet of raises. Seven diamond-drillholes, totalling 1,300 feet, were completed from surface.

New construction was as follows: an addition to the core shack (12 x 12 ft.); a compressor-house (10 x 20 ft.); a dry and workshop (20 x 20 ft.); a detonator storage (8 x 10 ft.); all frame construction, plywood covered.

G. G. Caron was manager, and nine men were employed during the period of operation.

McAllister Lease

The Buffalo property, consisting of forty acres, located in Coleman township on the south edge of the town of Cobalt, is owned by Agnico Mines Limited. For a number of years it has been leased by R. C. McAllister.

Operations progressed from May to August 1962. Results were inconclusive, and the lease was terminated.

The work was carried out from the Buffalo No. 7 shaft, and some 26 feet of crosscutting was completed. Three diamond-drillholes, totalling 208 feet, were completed from underground; seven holes, totalling 580 feet, were completed from surface. Surface-trenching, some 100 feet in length and averaging 2 feet in depth, was completed in 1962.

R. C. McAllister was manager, and two men were employed during the period of operation.

McIntyre Porcupine Mines Limited
(Castle Division)

Castle-Trethewey Mines Limited was incorporated in January 1922; in December 1959 all assets were purchased by McIntyre Porcupine Mines Limited, and it became the Castle Division of McIntyre. The directors and officers are given under McIntyre Porcupine Mines Limited in the gold operations section of this report. The McIntyre head office is at 25 King Street West, Toronto 1. The mine address is O'Brien.

The property, consisting of forty-two claims, is located in Haultain and Nicol townships, Gowganda area, District of Timiskaming. The property is in two sections: the Castle, and the Capitol mines. In recent years all major operations have been in the Capitol mine.

The mine operated throughout the year; the mill from 1 May to 8 December 1962.

SHAFTS, CASTLE AND CAPITOL MINES

	Claim No.	Inclination	Number of Compartments	Total Depth from Surface
				feet
CAPITOL MINE				
Capitol shaft	H.S.351	Vertical	2	819
Capitol winze (below 800-foot level)	H.S.351	Vertical	2	1,188
Inclined haulageway (below 1,125-foot level)	H.S.351	27°	2	1,425
Capitol Cobalt shaft (inactive) ..	H.S.351	Vertical	1	38
CASTLE MINE				
No. 1 shaft (inactive)	R.S.C.106	Vertical	—	460
No. 2 shaft (inactive)	R.S.C.101	—	—	160
No. 3 shaft	R.S.C.101	—	2	850

Development work in 1962 included 2,274 feet of drifting, 355 feet of cross-cutting, and 782 feet of raising. Total development footage, to 31 December 1962, was as follows: 34,046 feet of drifts; 16,137 feet of crosscuts; 7,785 feet of raises. Diamond-drilling in 1962 consisted of 139 holes, totalling 20,943 feet, from underground and five holes, totalling 4,463 feet, from surface. New construction consisted of a change-house of all-metal construction. An aftercooler was added to the main compressor (Canadian Ingersoll-Rand, capacity 5,000 cfm.).

The following is taken from the annual report of McIntyre Porcupine Mines Limited for the year ending 31 December 1962:

In the 12-month period, 20,759 tons of ore was milled, from which 940,615 ounces of silver was recovered for a gross value of \$1,257,494.

Net operating profit was \$549,643, an all-time high, compared with \$298,909 in 1961; this reflects a higher price of \$1.29 an ounce received for silver as against \$1.00 in 1961.

The high average price received last year was due for the most part to the fact that shipments of concentrates were withheld from December 1961 to September 1962 in anticipation of a rise in the price of silver.

At the end of 1961 reserves were almost depleted, and the same condition prevailed at the close of 1962. On the other hand, underground exploration is continuing, and at the date of writing some ore has been put in sight. Favorable places to look are becoming fewer, but the record price for silver justifies an extensive search.

Capital expenditures, of a minor nature, amounted to \$21,483.

The average number of employees was 75: 42 underground, and 33 on surface. G. D. McLeod was manager.

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Mentor Exploration and Development Company Limited

Mentor Exploration and Development Company Limited was incorporated in March 1926, with an authorized capitalization of 5,000,000 shares of \$0.50 par value, of which 3,455,746 shares have been issued. The directors and officers were: Denison Denny, president and director; A. W. Johnston, J. D. Smith, and E. A. Stern, directors; Miss Margaret B. Smith, secretary-treasurer. The head office is at Suite 1010, 100 Adelaide Street West, Toronto 1. The mine address is Box 739, Cobalt.

The Cobalt property comprises eight claims in Coleman township and four in Bucke township, District of Timiskaming. Operations were confined to the Coleman township property, formerly called the Sycee-Cobalt, which is just north of Cross Lake and adjoins the O'Brien ground on the east.

The vertical, three-compartment, main shaft, was collared and sunk 411 feet in 1961. In 1962 some 1,200 feet of lateral development was completed on the 400-foot level. Diamond-drilling consisted of 56 holes, totalling 11,521 feet, from underground.

The program failed to disclose any major silver-carrying veins, so in late November all equipment was removed from underground, and the mine was permitted to flood.

J. E. Armstrong, consulting engineer was in charge at the property, and an average of six men was employed.

Miller-Lorrain Mines Limited

Miller-Lorrain Mines Limited was incorporated in January 1961, with an authorized capitalization of 3,000,000 shares of \$1 par value, of which 1,000,005 shares have been issued. The officers and directors were: H. G. Miller, president and director; P. M. King, chairman of the board and director; Bernard Chubet, vice-president and director; P. E. Cain, director; Lillian McKinley, secretary-treasurer. The head office is at 392 Bay Street, Toronto, c/o J. A. Mahon, Q.C. The mine address is Cobalt, Box 142.

The property, consisting of eleven claims, is located in South Lorrain township, District of Timiskaming; it was operated for a number of years in the 1920's by the Nipissing Mining Company.

The present company in late 1962 commenced clearing a caved adit on Maidens Creek, and the caved collar of No. 1 shaft located on claim T.19261, South Lorrain township, which is connected to the adit. A building (16 x 22 ft.) was constructed to house a compressor, and the shaft was prepared for dewatering.

H. G. Miller, president, was in charge at the property, and three men were employed during the period of operation.

Patricia Silver Mines Limited

Patricia Silver Mines Limited was incorporated in December 1961, with an authorized capitalization of 5,000,000 shares of \$1 par value, of which 2,490,005 shares have been issued. The directors and officers were: G. E. Buchanan, president and director; R. J. Murphy, vice-president and director; Frank Cadesky, secretary-treasurer and director; A. J. Fortens, and R. J. Juby, directors. The head office is at 100 Adelaide Street West, Toronto 1. The mine address is Cobalt.

The property consists of seventeen claims in Coleman township, District of Timiskaming, about five miles southeast of the town of Cobalt. It includes the former Cochrane property with unusable shafts. The company leased the four-claim Beaver-Temiskaming property from Agnico Mines Limited and reactivated the Temiskaming shaft. The headframe was straightened and strengthened, the collar retimbered, and the shaft rehabilitated as the water was lowered.

Operations progressed from May to 31 December 1962.

SHAFTS, PATRICIA SILVER MINES

	Claim	Inclination	Number of Compartments	Total Depth from Surface
BEAVER				feet
No. 1.....	1348	Vertical	2	1,650
No. 1 winze (below 70 feet).....	—	Vertical	2	140
TEMISKAMING				
No. 1.....	441	Vertical	3	1,650
COCHRANE				
No. 1.....	—	Vertical	2	200
No. 2.....	—	60°	2	630

Development work in 1962 consisted of 143 feet of drifting on the 270-foot level. Some 36 diamond-drillholes, totalling 4,865 feet, were completed from underground. A total of 2,420 tons of ore was hoisted, and a 1,000-ton test run was completed at the La Rose mill of Silver-Miller Mines Limited.

A conveyance was placed in the shaft and, late in the year, a 48-inch, double-drum electric hoist replaced the air hoist. The shaft will be dewatered to the 500-foot level, and further diamond-drilling of Cochrane ground completed.

The average number of employees was 18: 12 underground, and 6 on surface. M. C. Halstead was general manager.

Professor Silver Mines Limited

Professor Silver Mines Limited was incorporated in August 1949, with an authorized capitalization of 2,000,000 shares of no par value, of which 1,477,838 shares have been issued. The directors and officers were: J. M. Cunningham-Dunlop, president and director; Douglas Henderson, vice-president and director; H. E. Cawley, W. B. Maxwell, G. C. Russell, and D. A. Thomson, directors; C. C. D. Pringle, secretary-treasurer; Gwendolyn M. Mahon, assistant-secretary; H. B. Briden, accountant. The head office is at 360 Bay Street, Toronto 1. The mine address is Box 39, Cobalt.

The property, comprising seventeen claims in Gillies Limit township, District of Timiskaming, formerly known as the South Giroux mine, is about 3½ miles south east of Cobalt.

Operations were continued from 1 January to 9 May 1962.

In 1961 an adit 920 feet long had been driven from the base of a sheer rock face, and lateral development followed on several silver veins intersected. The workings were approximately 200 feet below the highest point of ground, and some 1,930 feet of advance had been completed. In 1962 a further 865 feet of drifting was completed. Total development work at the time of closure consisted of an adit crosscut 920 feet long, with 1,856 feet of drifting off this adit. One diamond-drillhole was completed in 1962, totalling 510 feet, from underground.

G. R. Cunningham-Dunlop was manager, and five men were employed during the period of operation.

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Rix Athabasca Uranium Mines Limited

Rix Athabasca Uranium Mines Limited was incorporated in February 1950, with an authorized capitalization of 4,000,000 shares of \$1 par value; all shares have been issued, 225,000 are pooled. The directors and officers were: W. H. Bouck, president and director; R. D. Lord, vice-president and managing director; W. N. Millar, D. R. Derry, and J. B. Aird, directors; George Baker, secretary; D. A. Macfarlane, treasurer. The head office is at 335 Bay Street, Toronto 1. The mine address is Box 530, Cobalt.

The company leased the King Edward property from United Cobalt Mines in early 1960. This property comprises six claims totalling 197 acres in Coleman township, District of Timiskaming, on the west side of Cross Lake about 1.5 miles east of Cobalt.

Underground operations continued throughout 1962.

The vertical, two-compartment, King Edward winze, collared at adit elevation on the Watts claim has a vertical depth of 1,135 feet below the collar. The second level is 1,092 feet below the collar. Development footages consisted of 1,356 feet of drifting, 1,298 feet of crosscutting, and 1,467 feet of raising. Total development by the company, to 31 December 1962, was as follows: 1,356 feet of drifts; 2,693 feet of crosscuts; 1,467 feet of raises. Some 112 diamond-drillholes totalling 12,503 feet were completed from underground. New construction consisted of a second addition to the dry (10 by 8 ft., frame construction, shiplap-covered). A total of 6,319 tons of ore was hoisted; three bulk shipments totalling 4,849 tons were trucked to the O'Brien mill of Deer Horn Mines Limited for treatment.

The average number of employees was 23: 22 underground, and 1 on surface. E. C. Rudd was mine manager.

Rockzone Mines Limited

Rockzone Mines Limited was incorporated in March 1960, with an authorized capitalization of 4,000,000 shares of \$1 par value, of which, 1,593,952 shares have been issued. The directors and officers were: J. R. Nevison, president and director; J. M. Da Costa, secretary-treasurer and director; O. J. D. Ross and P. S. Broadhurst, directors. The head office is at Suite 407, 19 Melinda Street, Toronto 1. The mine address is Box 566, Cobalt.

The company acquired the former Smith-Cobalt property comprising about 720 acres in Coleman and Lorrain townships, District of Timiskaming, adjoining the Cross Lake-O'Brien holdings of Deer Horn Mines Limited on the east. The following development work had been completed by former operators: the vertical, three-compartment No. 1 shaft, located in claim No. 654, had been sunk to a depth of 420 feet below surface; the vertical, two-compartment No. 2 winze collared on the 400-foot level had been sunk 60 feet and a level established at 452 feet below surface; the vertical, two-compartment No. 3 winze, collared on the 452-foot level, had been sunk 75 feet and a level established 525 feet below surface.

The present company dewatered the shaft and rehabilitated the surface buildings in 1961: operations proceeded from May to December 1962.

Some nine diamond-drillholes, totalling 4,057 feet, were completed from underground.

New construction included a wooden headframe some 35 feet in height, and a hoist-room (12 x 12 ft., wood frame construction).

The following was added equipment:

- 1 hoist (10-x 12-in., SSR-single-drum, 42-x 30-in.-6,000-lb. capacity, Jenckes).
- 1 cage, aluminum (4.5 x 5 ft., Dorr-Oliver-Long).
- 1 hoisting rope (Tru-Lay $\frac{3}{4}$ -in., 28.9-ton breaking strain, Dominion Wire Rope Co.).
- 1 sheave wheel (4-ft. diam.).

E. Fleury was superintendent, and two men were employed.

Silverfields Mining Corporation Limited

Silverfields Mining Corporation Limited was incorporated in September 1962, with an authorized capitalization of 3,000,000 shares of \$1 par value, of which 1,200,005 shares have been issued. The directors and officers were: Sir Michael Butler, president and director; Stephen Kay, vice-president and director; C. G. McIntosh, general manager and director; J. B. Aird, and D. A. Perigoe, directors; D. S. Brown, secretary-treasurer. The head office is at Suite 914, 111 Richmond Street West, Toronto 1. The mine address is Box 739, Cobalt.

The property consists of four claims in Coleman township, District of Timiskaming. This was formerly known as the Alexandra property; it is located between Glen Lake Silver Mines and Silver Summit Mines at Diabase Mountain.

Former operators had sunk the vertical, two-compartment Alexandra shaft to a depth of 308 feet below the collar; levels had been established at 65-, 200-, and 300-foot depths, from which a total of 925 feet of drifts, 870 feet of crosscuts, and 124 feet of raises had been completed.

Operations commenced 20 November 1962 and were continuing at the year's end.

During the operating period in 1962 the steep access road to the property was made passable to vehicular traffic. A headframe (65 ft high, of 8- x 8-in. spruce timber); a frame shaft-house (27 x 20 ft.), and a frame hoist-house (16 x 30 ft.) insulated with concrete floor, were constructed. A single-drum air hoist (10 x 12 in. S.S.R., Canadian Ingersoll-Rand) and an aluminum cage (E. E. Long) were installed. The shaft was dewatered and rehabilitated. Ten diamond-drillholes, totalling 2,088 feet, were completed from underground.

J. E. Armstrong, consulting engineer, was in charge at the property, and six men were employed during the period of operation.

Silvermaque Mining Limited

Silvermaque Mining Limited was incorporated in July 1961, with an authorized capitalization of 4,000,000 shares of \$1 par value; 2,660,892 shares have been issued, of which 838,259 are pooled. The directors and officers were: A. D. Hellens, president and director; J. D. Bateman, vice-president and director; V. N. Harbinson, secretary-treasurer and director; G. B. Hellens, M. Bruce, H. Wilton-Clark, and P. H. McCloskey, directors. The head office is at 132 St. James Street West, Montreal, Que. The mine address is Cobalt.

Silvermaque Mining Limited commenced a development program on the Mayfair property in 1961. This property comprises 340 acres, in lot 2, concession II, in the southeast corner of Coleman township, District of Timiskaming, and extends westward across the Coleman township boundary into Block 6 of the Gillies Limit.

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Operations proceeded from 1 January to 30 June 1962. The vertical, two-compartment No. 1 shaft, on claim 304, Coleman township, is 420 feet deep. The two-compartment, 19-degree inclined No. 3 winze was collared on the 400-foot level, about 1,500 feet west of the shaft, and runs to a vertical depth of 557 feet below surface. There is also a vertical, two-compartment No. 2 shaft on claim No. 304, some 85 feet in depth.

Development work in 1962 consisted of 139 feet of drifting, 5 feet of cross-cutting, and 52 feet of raising. Total development footage at time of closure was 1,998 feet of drifts, 2,645 feet of crosscuts, and 52 feet of raises, on the 200-, 285-, 400-, 530-, and 550-foot levels. Eight diamond-drillholes, totalling 5,118 feet, were completed from underground.

All work ceased at the end of June; the mine was permitted to flood; a watchman remained on the property.

F. G. Chitty was superintendent, and five men were employed during the period of operation.

Silver-Miller Mines Limited

Silver-Miller Mines Limited was incorporated in January 1946, with an authorized capitalization of 3,000,000 shares of \$1 par value; in 1952 the number of shares was increased to 4,000,000; in 1953, to 5,000,000; and in 1960, to 6,000,000, of which 4,996,181 shares have been issued. The directors and officers were: Murray Cooper, president and director; R. K. Hart, vice-president and director; J. M. Wainberg, secretary-treasurer and director; M. C. Hill, J. D. Streit, and F. M. Fell, directors. The head office is at 357 Bay Street, Toronto. The mine address is Box 230, Cobalt.

The company owns a number of properties in Coleman and Lorrain townships and in the Gillies Limit, District of Timiskaming. Claims owned by Kerr Lake Mining Company and located south of the Lawson mine were acquired in 1959. Production in 1962 was obtained from the company's Kerr Lake dump and the Conisil underground workings. Ore is trucked a distance of four miles to the La Rose mill.

CONISIL PROPERTY

Silver-Miller Mines Limited acquired, in 1960, an option to purchase claims held by Conisil Mines. The property comprising about 80 acres adjoins the Lawson mine on the southwest.

Underground operations continued throughout 1962.

The vertical, two-compartment Conisil shaft, located in claim J.B.27, has a depth of 625 feet below the collar. Development work in 1962 consisted of 718 feet of drifting, 462 feet of crosscutting, and 628 feet of raising. Total development footage, to 31 December 1962, was as follows: 2,952 feet of drifts; 979 feet of crosscuts; 1,456 feet of raises. Some 39 diamond-drillholes, totalling 9,640 feet, from underground and one hole, totalling 161 feet, from surface were completed in 1962.

A total of 2,115 tons of ore was hoisted and milled.

KERR LAKE PROPERTY

The Kerr Lake property comprises about 137 acres in Coleman township adjoining the Lawson mine. Development work at the Lawson mine had progressed into the Kerr Lake property on the 300- and 400-foot levels. No accurate records

of shafts, winzes, or development footage by former operators is available for the Kerr Lake property.

A total of 4,209 tons from the Kerr Lake dump was treated in the La Rose mill.

LAWSON MINE

Operations at the Lawson mine, which comprises one claim in Coleman township, continued in 1962.

SHAFTS, LAWSON MINE

	Location	Inclination	Number of Compartments	Depth
No. 8 shaft	SW. 1/4 of N. 1/2, lot 3, con. IV, Coleman twp.	Vertical	2	feet 410
Main shaft	SW. 1/4 of N. 1/2, lot 3, con. IV, Coleman twp.	Vertical	2	195

Development work in 1962 consisted of 144 feet of raising. Total development footage, to 31 December 1962, was as follows: 19,699 feet of drifts; 2,816 feet of crosscuts; 5,118 feet of raises.

The following is taken from the company annual report for the year ending 30 April 1962:

Milling and Production

Milled	tons	42,053
Calculated heads per ton silver	oz.	7.68
Mill residues per ton silver	oz.	0.98
Recovery	percent	87.18
Over-all production (silver)	oz.	281,278.83

Milling operations ceased on the last day of January, 1962, so the above figures represent nine months milling only.

The above 42,053 tons milled can be broken down as follows:

Source	Milled	Calc. Heads	Silver	Cobalt	Copper	Nickel
	tons	tons	ounces	pounds	pounds	pounds
Kerr Lake surface dumps	37,654	4.97	187,178	6,399	37,854	1,135
Conisil mine	4,399	21.39	94,100	2,850	9,347	664
Total	42,053	6.69	281,278	9,249	47,201	1,799

The mill handled an average of 202 tons per running day. Average cost per ton milled was \$2.01.

The following is a brief description of developments from 30 April to 15 August 1962.

Long drillholes laid out from the east face of the 535-foot level of the Conisil mine were drilled to test known veins on the adjoining Hargreaves claim of the Kerr Lake property. The first hole picked up a vein of cobalt and silver at 500 feet.

Three subsequent holes each picked up veins with silver values at approximately the same distance. The satisfactory results from the drilling suggested that exploration other than diamond-drilling would now be justified.

Drifting commenced on the bottom or 610-foot level and has advanced to a point 75 feet below the second intersection.

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Already two veins have been partially opened-up disclosing some excellent mill-grade silver. Mining is in progress to determine the lateral and vertical extent of these occurrences. An estimate of silver ore in place is difficult to economically assess. Vein structures are unpredictable, and the encountered silver values cover an extremely wide range.

Past experience, however, would suggest that the contemplated broadened development and exploration program should materially enhance the company's future productive capacity.

The average number of employees was 19: 10 underground, and 9 on surface. H. B. McLean was manager.

Silver Regent Mines Limited

Silver Regent Mines Limited was incorporated in January 1962, with an authorized capitalization of 5,000,000 shares of no par value, of which 2,425,005 shares have been issued. The directors and officers were: E. L. Baxter, president and director; N. B. Sheriff, vice-president and managing director; Irving Dobbs, Milton Klyman, and L. J. Whitehouse, directors; Gordon McLaughlin, secretary-treasurer. The head office is at Room 1500, 372 Bay St., Toronto 1. The mine address is Box 9, Cobalt.

The property, formerly known as the Fisher-Eplett, comprises four claims in Coleman township, District of Timiskaming. It lies just northwest of the Beaver group and is about four miles south of Cobalt.

In 1962 the vertical, two-compartment Fisher-Eplett shaft, located in lot 1, concession IV, Coleman township, was sunk 171 feet to a total depth of 489 feet below surface. The 400- and 475-foot levels were established. Development work in 1962 consisted of 200 feet of crosscutting, and 57 feet of raising. Total development footage to 31 December 1962 was as follows: 1,536 feet of drifts; 1,925 feet of crosscuts; 107 feet of raises. Some 20 diamond-drillholes, totalling 3,530 feet, were completed from underground.

New construction included a 50-foot headframe, a hoistroom (20 x 16 ft.), and a change house (24 x 18 ft.), all frame construction.

The average number of employees was 3: 2 underground, and 1 on surface. L. J. Cunningham was resident manager.

Silver Summit Mines Limited

Silver Summit Mines Limited was incorporated in June 1962, with an authorized capitalization of 5,000,000 shares of \$1 par value, of which 2,100,005 shares have been issued. The directors and officers were: G. E. Buchanan, president and director; A. J. Fortens, vice-president and director; Frank Cadesky, secretary-treasurer and director; C. L. Murray and E. H. Clark, directors. The head office is at 100 Adelaide Street West, Toronto 1. The mine address is Cobalt.

The company purchased, in mid-summer, the privately owned Mensilvo mine consisting of 25 acres in lot 5, concession IV, Coleman township, and combined it with their adjacent 42-acre Savage property, also in Coleman township. The Savage property lies to the north of the Mensilvo property about three miles southeast of Cobalt, on the road leading to the Ragged Chute compressed air plant.

The vertical, one-compartment Mensilvo No. 7 shaft, 214 feet deep, had been dewatered, and intermittent mining and milling carried on, during the early months of 1962, by the private owner. An active development program commenced when the present company took over. Drives easterly on the 140-foot level entered the

Savage property, where encouraging silver values were encountered. Development work in 1962 consisted of 691 feet of drifting and 20 feet of crosscutting. Diamond-drilling consisted of 16 holes, totalling 3,226 feet, from underground.

M. C. Halstead was general manager, and 26 men were employed during the period of operation.

Siscoe Metals of Ontario Limited

Siscoe Metals of Ontario Limited is a wholly owned subsidiary of Siscoe Mines Limited, incorporated in September 1950. The directors and officers were: J. B. Lynch, president and director; C. A. Robinson, vice-president and director; J. G. Ahern, E. E. Campbell, A. H. Campbell, and J. P. Crete, directors; A. P. Garratt, assistant to the president; C. M. Masterman, secretary-treasurer; R. M. P. Fisk, assistant treasurer. The head office and mine address is O'Brien.

The company owns and operates the Siscoe Metals property, formerly the Miller Lake O'Brien mine, comprising fourteen claims in Nicol and Haultain townships, Gowganda area, District of Timiskaming.

Mining and milling continued throughout 1962. Work was carried on through No. 6 shaft, which was created in 1956 by raising No. 6 winze to surface.

SHAFTS, SISCOE METALS MINE

	Claim No.	Inclination	Number of Compartments	Collar Depth	Vertical Depth Below Surface
				feet	feet
No. 6 shaft	R.S.C.91	Vertical	3 and 2	surface	925
No. 2 shaft	R.S.C.91	75½°	2 (inactive)	surface	438
No. 20 shaft	R.S.C.94	76°	2 (inactive)	surface	159
No. 1 winze	—	75°	2 (inactive)	350	458
No. 2 winze	—	82°	2 (inactive)	350	460
No. 3 winze	—	76°	2 (inactive)	350	402
No. 4 winze	—	82°	2 (inactive)	350	530
No. 5 winze	—	Vertical	2 (inactive)	525	640
No. 7 winze	—	75°	2 (inactive)	730	902
No. 8 winze	—	68°	2 (inactive)	730	788
No. 9 winze	—	Vertical	3 (inactive)	730	898
No. 10 winze	—	69°	2 (inactive)	900	970
No. 11 winze	—	Vertical	2	850	1,369
SHAFTS AND WINZES NOT CONNECTED TO PRESENT WORKINGS					
UPPER BONSAI					
No. 1 shaft	R.S.C.95	Vertical	2 (inactive)	surface	85
No. 2 shaft	R.S.C.84	80°	2 (inactive)	surface	115
No. 3 shaft	R.S.C.84	Vertical	2 (inactive)	surface	68
LOWER BONSAI					
No. 1 shaft	R.S.C.83	76°	2 (inactive)	surface	132
MILLERETT					
No. 1 shaft	R.S.C.95	Vertical	2 (inactive)	surface	85
No. 7 shaft	R.S.C.95	Vertical	2 (inactive)	surface	210
No. 9 shaft	R.S.C.95	Vertical	1 (inactive)	surface	35
No. 10 shaft	R.S.C.95	77°	2 (inactive)	surface	127
No. 1 winze	—	65°	2 (inactive)	70	136
No. 2 winze	—	79°	2 (inactive)	200	303

The deepening of No. 6 shaft was commenced, and 90 feet completed, in 1962 to a vertical depth of 925 feet below surface. The 1,000-foot level was established in No. 6 shaft, 905 feet below the collar; and the 1,350-foot level in No. 11 winze, 500 feet below the collar.

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Development work in 1962 consisted of 4,411 feet of drifting, 1,451 feet of crosscutting, and 821 feet of raising. Total development footage by present operators, to 31 December 1962, was as follows: 70,841 feet of drifts; 18,296 feet of crosscuts; 6,931 feet of raises. Diamond-drilling in 1962 consisted of 166 holes, totalling 23,343 feet, from underground and one hole, totalling 421 feet from surface.

New equipment added included the following:

- 2 stoper drills (Atlas).
- 1 rock drill (AL-47, Joy).
- 2 stoper drills (JR-38D, Canadian Ingersoll-Rand).
- 1 locomotive (Mancha).
- 2 rocker shovels (Eimco).
- 1 fan (12-in. Korfmann).
- 1 pump with motor and belt-drive (Canadian Ingersoll-Rand).

The following is taken from the company annual report for the year ending 31 December 1962:

Mining

SOURCES OF ORE FROM THE MINE TO THE MILL

	1962			1961		
	Ore	Grade	Total	Ore	Grade	Total
	tons	oz. per ton	oz.	tons	oz. per ton	oz.
Development	6,099	20.97	127,900	8,188	22.02	180,278
Mining	62,566	21.48	1,343,765	59,027	21.02	1,240,844
Waste rock (to backfill)	15,143	—	—	10,412	—	—
Broken-ore reserves	17,673	—	—	14,866	—	—

Of the total ore hoisted—42 percent of the tonnage ore—41 percent of the ounces came from levels above the 900, and the balance came from No. 11 winze workings.

Milling

	1962	1961
Ore treated tons	68,665	67,215
Calculated heads per ton oz.	21.22	20.50
Mill residues per ton oz.	0.71	0.68
Recovery percent	96.63	96.70
Total recovery—mill oz.	1,407,987	1,332,128
Hand-picked mine ore oz.	63,678	88,994
Over-all silver production oz.	1,471,665	1,421,122

The mill operated efficiently throughout the year, handling an average of 245 tons per operating day. Including hand-picked high-grade, over-all recovery in high-grade form accounted for 87.5 of total production, distributed as shown:

	1962	1961
Hand-picked high-grade percent	4.3	6.0
High-grade concentrates percent	83.2	80.0
Flotation concentrates percent	12.5	14.0
Total	100.0	100.0

Operating Costs

	1962		1961	
	Per Ton	Per Ounce Silver	Per Ton	Per Ounce Silver
Marketing (including smelting).....	\$ 2.17	\$0.101	\$ 2.10	\$0.099
Exploration and development.....	2.23	0.104	2.04	0.096
Mining.....	5.33	0.249	5.60	0.264
Milling.....	1.72	0.080	1.71	0.080
Mine overhead.....	1.21	0.057	1.30	0.061
Total Mine Operating Cost.....	\$12.66	\$0.591	\$12.75	\$0.600

Operating costs were \$0.09 per ton lower than in 1961, in spite of an increase of \$0.19 per ton in exploration and development and \$0.07 in marketing and smelting. This satisfactory result was achieved by a reduction in mining costs and mine overhead. At the same time, broken-ore reserves were increased by approximately 2,800 tons. Expenditure on the shaft-sinking project, not included in operating cost, was \$21,815. A sum of \$138,000 has been budgeted for this work in 1963.

The average number of employees was 100: 65 underground, and 35 on surface. E. A. Pearson was mine manager.

Tormont Mines Limited

Tormont Mines Limited was incorporated in July 1949, with an authorized capitalization of 5,000,000 shares of \$1 par value, of which 2,900,000 shares have been issued. The directors and officers were: Andrew Robertson, president and director; Wilfred Garnett, vice-president and director; G. D. Pattison, secretary-treasurer and director; R. D. Bell, assistant secretary-treasurer and director; S. J. O. McClay, director. The head office is at Suite 405, 25 Adelaide Street West, Toronto 1. The mine address is Elk Lake, care of Lost Lake Lodge.

The property consisting of thirty-four claims, formerly known as the Wigwam Silver mine, is located in Haultain and Chown townships, District of Timiskaming, east of Lost Lake. Former operators had completed the Wigwam adit and winze on claim M.R.13255, and the Haultain shaft on claim M.R.12913. The Wigwam adit was 800 feet in length with 80 feet of backs above the adit level; the vertical, two-compartment Wigwam adit winze extended 180 feet below the adit level. The vertical, two-compartment Haultain shaft was 375 feet deep, with levels at 125, 150, 250, and 350 feet in depth.

Operations proceeded from 20 September to 22 December 1962.

Development work consisted of driving an inclined raise, some 92 feet in length, from the Wigwam adit to surface. Some 40 feet in length of surface-trenching averaging 3 feet in depth was completed. Diamond-drilling consisted of 17 surface holes, totalling 5,789 feet. A frame dry (14 x 16 ft.) was constructed; and a compressor (250-cfm. Atlas Copco) was purchased.

R. A. Grainger was resident engineer, and four men were employed during the period of operation.

TELLURIUM—see NICKEL AND COPPER

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THORIUM

Rio Tinto Dow Limited

Rio Tinto Dow Limited was incorporated in January 1958, with an authorized capitalization of 200,000 shares of \$10 par value, of which 35,000 shares have been issued. The directors and officers were: Hon. R. H. Winters, president and director; L. D. Smithers, vice-president and director; J. D. Head, general-manager and director; E. B. Gillanders, A. F. Lowell, D. J. McParland, W. J. Rave, and J. L. Smart, directors; George Baker, secretary; B. A. Howard, treasurer; G. R. Devey, assistant secretary; H. J. Attwater, assistant-treasurer. The head office is at 335 Bay Street, Toronto. The plant address is Box 190, Elliot Lake.

The thorium crude section at the Rio Algom Quirke mine did not operate for several months in early 1961, owing to the closing of that mine. This section and a research pilot plant were constructed in the mill at the Rio Algom Nordic mine. The plant is designed to produce a thorium concentrate from treatment of the Rio Algom Nordic mill tailings using a solvent extraction process. The final thorium processing is still completed at the Rio Algom Quirke mine.

The plant operated throughout 1962.

The average number of employees was 26. J. L. Hopkins was plant superintendent, and M. E. Grimes was research manager.

URANIUM OXIDE

The quantity of uranium oxide produced in 1962 was 14.47 percent less than the quantity produced in 1961 and the value of production decreased 21.70 percent.

The industry paid \$3,102,086 to 501 salaried employees, and \$18,036,719 to 3,089 wage-earners. Fuel and electricity cost \$3,457,901, and process supplies cost \$17,477,641.

Denison Mines Limited

Denison Copper Mines Limited was incorporated in November 1936; it was succeeded in 1946 by Denison Nickel Mines Limited; in 1949 the name was changed to North Denison Mines Limited; in March 1954, it was again changed to Consolidated Denison Mines Limited; in March 1960, on amalgamation of Consolidated Denison Mines Limited and Can-Met Explorations Limited, the name was changed to Denison Mines Limited. The authorized capitalization is 6,000,000 shares of \$1 par value, of which 4,474,703 shares have been issued. The directors and officers were: S. B. Roman, president and director; A. W. Stollery and Hon. H. A. Willis, vice-presidents and directors; F. H. Jowsey, B. E. Willoughby, J. F. Crothers, J. S. Williams, G. C. Knowles, and L. R. Perini, directors; John Kostuik, vice-president and general manager; J. C. Puhky, secretary-treasurer; E. B. McConkey, assistant secretary-treasurer. The head office is at 4 King Street West, Toronto 1. The mine address is P.O. Box B-2600 Elliot Lake.

The Denison property comprises eighty-eight claims in Townships 144 and 150, Blind River area, District of Algoma.

SHAFTS, DENISON MINE

	Claim No.	Inclination	Number of Compartments	Total Depth from Surface
No. 1 shaft.....	S.86071	Vertical	5	feet 1,856
No. 2 shaft.....	S.86118	Vertical	8	2,776

Development work in 1962 consisted of 8,994 feet of drifting and 108 feet of raising. Total development footage on a single plane, to 31 December 1962, was as follows: 136,271 feet of drifts; 2,129 feet of raises. Some 1,143 diamond-drill-holes, totalling 22,262 feet, were completed from underground, and two holes, totalling 1,165 feet, were completed from surface during 1962.

The following is taken from the company annual report for the year ending 31 December 1962:

Mining

Better unit performance and improved material controls have reduced costs over the previous year.

A total of 1,831,059 tons of ore was hoisted: 1,031,746 tons from No. 1 shaft; 799,313 tons from No. 2 shaft. A total of 44,380 feet was driven. Positive ore reserves were maintained during this period.

The northeast conveyor axis mentioned in last year's report was completed. It is designed to service in excess of 4,000,000 tons of ore. A total of 1,000 feet of conveyor axis B was developed. This will eventually become the main north-south transportation artery for the mine.

Explosives costs were reduced 33 percent per ton broken by the conversion of the blasting operation to ammonium nitrate-fuel oil blasting agents. Haulage maintenance costs were reduced by an average of 30 percent for trucks and shuttle-cars. Rock-drill repair costs decreased by 6.5 percent per foot drilled, and slusher maintenance costs by 27 percent per ton handled.

Summary of Production

	1959	1960	1961	1962
Broken..... tons	2,189,316	2,021,643	2,043,946	1,808,011
Milled (dry)..... tons	2,046,250	2,013,846	2,033,483	1,828,993
Average milled per day (dry)..... tons	5,672	5,787	5,827	5,680
Recovery..... percent	93.55	93.04	93.18	93.11
U ₃ O ₈ produced..... lb.	4,916,108	4,911,761	5,379,168	4,844,259
Average U ₃ O ₈ per ton..... lb.	2.56	2.70	2.85	2.88

Milling

A total of 1,828,993 dry tons was treated for a daily average of 5,680 dry tons as compared to 5,827 dry tons for 1961. Despite a reduction of 10 percent in tons treated, the efficiency of the mill was maintained.

The average grade of ore treated during the year showed a slight increase to 2.88 pounds U₃O₈, which establishes the fourth consecutive year of improvement.

Increased control in the use of acid, chlorate, and steam has been realized through automation, which now provides for immediate adjustment to the characteristics of the ore being processed.

Rock Mechanics Studies

Results of rock mechanics studies have assisted the engineers in planning mining layouts on a sound scientific basis. These studies of ground movements are being continued to investigate and assess measuring techniques.

Safety

The projected goal of a reduction by 30 percent in compensable accident frequency was exceeded by 6.8 percent.

The average number of employees was 1,079: 818 underground, and 261 on surface. M. J. deBastiani was mine manager.

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Faraday Uranium Mines Limited

Faraday Uranium Mines Limited was incorporated in June 1949, with an authorized capitalization of 5,000,000 shares of \$1 par value, of which 4,405,910 shares have been issued. The directors and officers were: A. W. Johnston, president and director; William McKee, secretary-treasurer and director; A. B. Whitelaw, W. C. Campbell, G. L. Jennison, L. E. Wetmore, and J. K. McCausland, directors; W. M. O'Shaughnessy, assistant secretary-treasurer. The head office is at 100 Adelaide Street West, Toronto. The mine address is Bancroft, R.R. No. 3.

The property comprises eight claims in Faraday township, Hastings County. Mining and milling operations continued throughout 1962.

SHAFTS, FARADAY MINE

	Location	Inclination	Number of Compartments	Total Depth Below Adit Level
No. 1 shaft.....	Lot 16, con. XI, Faraday twp.	Vertical	3 to 750 ft.	feet 1,455
No. 2 shaft.....			4 below 750 ft.	
	Lot 17, con. XI, Faraday twp.	Vertical	3	196

Development work in 1962 consisted of 399 feet of drifting, 208 feet of crosscutting, and 704 feet of raising. Total development footage, to 31 December 1962, was as follows: 49,234 feet of drifts; 31,864 feet of crosscuts; 38,205 feet of raises. Diamond-drilling in 1962 consisted of 32 holes, totalling 4,448 feet, from underground.

New equipment added underground included three Sala slushers (30-hp., 35530, Tenace Tools) and five Pacific scrapers (48-in., Lecky Machinery). One Chevrolet pickup truck (½-ton, General Motors) was added surface equipment.

The following is taken from the company annual report for the year ending 31 December 1962:

At the beginning of the year, the mining program was planned on the basis of closing the operation at the completion of the sales contracts in October 1962. In July, the United Kingdom contracted to purchase 24,000,000 pounds of Canadian uranium. Faraday's share of this contract was 1,083,191 pounds of U_3O_8 , to be delivered from October 1962 to March 1964, at a rate of 65,000 pounds per month. In July the mining program was adjusted to provide for this new contract.

During the first half of the year the working force was reduced from 247 to 197 employees. Development was stopped, and mining was reduced to a minimum. Broken reserves supplied 65 percent of the mill feed.

Beginning in July the working force was built up to 250, mining was increased, and a minimum development program resumed. By the year's end the mine was back on a normal basis.

Production

Production was maintained at the normal shipping rate of 65,000 pounds of U_3O_8 per month. Total production amounted to 774,344 pounds of U_3O_8 .

Mining

During the first six months, mining on the upper levels was limited to breaking and cleaning down shrinkage stopes. On the lower levels, backs were taken down, and two cut-and-fill stopes operated.

Broken reserves were reduced from 187,973 tons of 0.112 percent U_3O_8 to 74,039 tons of 0.138 percent U_3O_8 . Rate of breaking ore was gradually reduced to 5,000 tons per month.

During the remainder of the year, new mining was concentrated principally on the 750- and 900-foot levels, where seven cut-and-fill stopes were prepared for production. Break was increased to balance tonnage milled.

Total ore broken was 195,524 tons, compared to 282,334 tons in 1961.

Milling

	1962	1961	1960	1959	1958
Milled..... tons	306,339	339,659	468,939	537,594	491,826
Milled per day..... tons	839	931	1,282	1,473	1,347
Heads..... percent U ₃ O ₈	0.134	0.122	0.100	0.087	0.092
Tails..... percent U ₃ O ₈	0.007	0.006	0.0049	0.0040	0.0056
Recovery..... percent	94.66	95.06	95.11	95.34	94.00
Precipitate grade..... percent U ₃ O ₈	73.85	74.50	76.14	75.66	70.50

Ore Reserves

As no new ore was developed, the reserves were reduced by the amount of the year's production. Proven ore is sufficient to complete the present contract. Probable ore consists of ore indicated with limited diamond-drilling below the 900-foot level. Results from this work have been satisfactory, and additional ore will be developed when necessary.

A comparison of present reserves with the previous year follows:

	1962			1961		
	Tons	Grade	Pounds U ₃ O ₈	Tons	Grade	Pounds U ₃ O ₈
Proven Ore:						
Broken.....	70,572	0.099	140,365	187,983	0.112	421,998
Solid.....	294,795	0.141	830,989	499,910	0.127	1,274,126
Total proven ore.....	365,367	0.133	971,355	687,893	0.123	1,696,124
Probable ore.....	228,750	0.105	479,540	243,400	0.105	510,068
Total proven and probable ore.....	594,117	0.122	1,450,895	931,293	0.118	2,206,192

Costs

Monthly unit costs fluctuated over a wide range due to the variation in the mining program. The yearly average unit costs were below normal, owing to the reduced mining and development program.

A comparison with unit costs in previous years is listed:

	1962	1961	1960	1959	1958
Development.....	\$0.33	\$1.39	\$1.40	\$2.12	\$ 2.54
Mining.....	4.05	4.31	4.35	3.96	4.41
Milling.....	3.77	3.47	2.96	3.00	3.05
Total.....	\$8.15	\$9.17	\$8.71	\$9.08	\$10.00

The average number of employees was 232: 104 underground, and 128 on surface. D. R. Wilson was mine manager.

Macassa Gold Mines Limited
(Bicroft Division)

Bicroft Uranium Mines Limited was formed in April 1955, as an amalgamation of Centre Lake Uranium Mines Limited and Croft Uranium Mines Limited. On 1 November 1961, Bicroft Uranium Mines Limited and Macassa Mines Limited were amalgamated under the name of Macassa Gold Mines Limited. Details of the amalgamation, the officers and directors are given in the gold section of this report, under Macassa Gold Mines Limited. The mine address of the Bicroft Division is R.R. No. 3, Bancroft.

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The Croft properties are in Cardiff township, Haliburton county, and Faraday and Herschel townships, Hastings county. The Centre Lake property is in Cardiff township.

Operations at the Centre Lake property continued throughout 1962.

SHAFTS, CENTRE LAKE MINE

Location	Inclination	Number of Compartments	Total Depth from Surface
No. 1 shaft, claim E.O.5936; N.½, lot 27, con. XI, Cardiff twp.....	Vertical	3	234
No. 2 shaft, S.½, lot 28, con. XI, Cardiff twp....	Vertical	5	1,843

Development work in 1962 consisted of 10,909 feet of drifting, 9,583 feet of crosscutting, and 17,752 feet of raising. Total development footage, to 31 December 1962, was as follows: 76,511 feet of drifts; 62,391 feet of crosscuts; 83,063 feet of raises. Diamond-drilling in 1962 consisted of 507 holes from underground, totalling 71,489 feet.

The following is taken from the company annual report for the year ending 31 December 1962:

Production

The data tabulated below summarize operating results in 1962. Figures are based on price received under the United Kingdom agreement.

Value of production.....	\$4,682,178
Hoisted..... tons	404,536
Average per day..... tons	1,108
Discarded in sorting plant..... tons	48,686
Milled..... tons	355,914
Average milled per day..... tons	975
Recovery per ton milled.....	\$13.16
Recovery..... percent	94.3
Grade of mill feed.....	\$14.03

Operating Costs

	Per Ton Milled	
	1962	1961
Development.....	\$ 2.58	\$ 2.34
Mining.....	4.92	5.09
Milling.....	3.29	3.15
General mine expense.....	0.77	0.85
Total.....	\$11.56	\$11.43

The decrease in operating profit was because the price received for our product was 17 percent less than the previous year, which in turn was 30 percent less than the year before; and because costs increased due to loss of efficiency and labour turnover. In addition, a loss of \$366,185.63 applicable to 1961 production, and due to the price adjustment caused by the United Kingdom contract, had to be absorbed. This loss was charged to surplus, and is not included in 1962 figures.

Mining

All mining operations were practically confined to the block of levels from the 9th to the 13th levels, with most of the development work being done on the 11th, 12th, and 13th levels.

The average stoping length during the year was 32 feet having an average width of 5.5 feet. During the year, 71,848 tons of development and sorting-plant waste was used as stope backfill.

Ore Reserves

The ore zone structure has persisted to depth, and on the bottom level shows very little change. As to whether the tons per vertical foot would be comparable at this horizon, is redundant, as the level will not be fully developed before the mine closes down. There will be sufficient ore to run the mine as long as it is economically feasible to do so.

Milling

Feed to the crusher plant totalled 404,536 tons. A total of 87,327 tons (20.5 percent) of this feed was processed in the sorting plant, and 48,686 tons (55.8 percent) was discarded as waste.

The mill operated at an average rate of 975 tons of sorted ore per day. The over-all recovery was 94.3 percent, the same as in 1961. There was some difficulty in replacing several reagents used in the process, which the manufacturers no longer produce.

Milling costs were up 14 cents per ton, due mainly to increased consumption of sulphuric acid and lime. Also, maintenance costs were higher, due to replacing worn parts.

The average number of employees was 490: 300 underground, and 190 on surface. J. D. Bryce, executive vice-president was in charge.

Rio Algom Mines Limited

Algom Uranium Mines Limited was incorporated in July 1953; Milliken Lake Uranium Mines Limited was incorporated in October 1952; Northspan Uranium Mines Limited was incorporated in June 1956; Pronto Uranium Mines Limited was incorporated in June 1953. The four companies were controlled by Rio Tinto Mining Company of Canada Limited. In June 1960, they were amalgamated under the name of Rio Algom Mines Limited, with an authorized capitalization of 12,000,000 shares of no par value, of which 10,612,132 shares have been issued. The directors and officers were: Hon. R. H. Winters, president and director; H. G. De Young and E. B. Gillanders, vice-presidents and directors; W. B. Malone, vice-president (finance) and director; W. H. Bouck, Henry Borden, F. G. Gardiner, Sam Harris, Leo Model, F. A. Petito, J. N. V. Duncan, C. C. Calvin, W. A. Arbuckle, L. A. Lapointe, J. B. Ridley, W. A. Thomas, J. G. Edison, Hon. S. A. Hayden, Sir Mark Turner, J. H. Smith, and R. W. Wright, directors; George Baker, secretary; H. S. Wilson, controller and treasurer. The head office is at 335 Bay Street, Toronto 1. The address of the mines in the Elliot Lake area is Elliot Lake. Details on the Rio Algom Mines Limited, Pronto Division, Pater mine appear in the Nickel-Copper section of this report.

ALGOM DIVISION

The property comprises some 283 claims in the Blind River area, District of Algoma. Two mines, the Nordic and the Quirke, were operated. Milling operations were suspended at the Quirke mine on 26 January 1961, and the mine is maintained on a care-and-maintenance basis.

Nordic Mine

Mining and milling operations continued throughout 1962 at the Nordic mine, consisting of 140 claims in Townships 143, 149, and 155.

The vertical, six-compartment, Nordic No. 1 shaft, located on claim S.66619, in Township 149, has a total depth of 1,780 feet below the collar. Development work in 1962 consisted of 8,819 feet of drifting, 6,275 feet of crosscutting, and 19,759 feet of raising. Total development footage, to 31 December 1962, was as follows: 74,106 feet of drifts; 19,394 feet of crosscuts; 131,561 feet of raises. Some 6 diamond-drillholes, totalling 866 feet, were completed from underground, and 10 holes, totalling 14,700 feet, were completed from surface.

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New equipment added was as follows:

- 6 slushers (50-hp., with 60-in. Pacific scrapers, Canadian Ingersoll-Rand).
- 10 mine cars (140-cu. ft., Granby).
- 3 loaders (21-55 rocker, Eimco).
- 2 trolley locomotives (type 1 ME-2C8-0, Canadian General Electric).
- 1 portable compressor, Canadian Ingersoll-Rand).

A total of 1,111,170 tons of ore was hoisted; 1,113,400 tons was milled; the mill averaged 3,172 tons daily for 351 operating days.

MILLIKEN DIVISION

The property consists of twenty-four claims immediately east of Elliot Lake in Township 149, District of Algoma.

Mining and milling operations continued throughout 1962.

SHAFTS, MILLIKEN LAKE MINE

	Location	Inclination	Number of Compartments	Total Depth from Surface
No. 1 shaft (service).....	S.80247	Vertical	2	feet 3,071
No. 2 shaft (production).....	S.80247	Vertical	3	3,400

No. 276 south service raise is inclined and has a total length of 1,852 feet.

Development work in 1962 consisted of 7,119 feet of drifting, 55 feet of crosscutting, and 27,284 feet of raising. Total development footage, to 31 December 1962, was as follows: 44,379 feet of drifts; 8,776 feet of crosscuts; 135,048 feet of raises. Diamond-drilling in 1962 consisted of some 2,224 holes, totalling 25,615 feet, from underground.

A total of 955,596 tons of ore was hoisted; 958,390 tons was milled at an average of 2,730 tons daily.

NORTHSPAN-PANEL DIVISION

The properties include: the Lacnor mine (formerly called the Lake Nordic); the Buckles property in Township 149; the Panel mine in Township 144; and the Spanish American mine in Township 150; all in the Blind River area, District of Algoma.

The Buckles property closed in October 1958, when all available ore had been removed; the Spanish American mine discontinued operations in February 1959; the Lacnor mine in June 1960; and the Panel mine in June 1961.

The following is taken from the company annual report for the year ending 31 December 1962.

Operations during the year 1962 at the Milliken and Nordic mines continued satisfactorily at predetermined levels. A considerable amount of development work was accomplished at both mines, and new ore was brought into reserves. The improvements put into effect during the year helped to offset, to a major extent, rising costs of operation.

The cost of minimum maintenance and protection of remaining plant and equipment and property at the idle uranium mines was substantially reduced.

Production

Deliveries of uranium concentrates were made to Eldorado Mining and Refining Limited in accordance with contract requirements at an average rate, during the year, of 445,000 pounds per month; of this an average of 297,000 pounds per month was under the company's own contract, and the balance under the contract that Preston Mines Limited has with Eldorado. Production from the Milliken and Nordic mines together, amounted to about 4,993,000 pounds.

Milling

Further technical changes were made at each of the mills during the year to improve efficiencies and costs. At Milliken, the most important was the conversion of two-stage leaching, which was completed in May 1962 and resulted in a reduction of approximately 4.7 percent in the average direct milling cost per ton of ore compared with 1961.

A similar conversion at the Nordic mill was not, until recently, economically necessary because of the comparatively lower cost of certain mill process supplies. Conversion plans are now being studied. However, one improvement at Nordic was a change in the elution circuit of the ion-exchange process, which brought about a reduction of \$3,760 per month in the cost of nitric acid and ammonia consumed.

The reduction in manpower continued during the year, and at each mill it amounted to about 7 percent.

Production Summary	1962	1961	1960
Total tons milled..... ton	2,071,790	2,850,921	5,050,004
Average calculated heads (U ₃ O ₈ per ton)..... lb.	2.56	2.55	2.39
Average recovery based on average calculated heads . percent	94.3	94.1	93.5

Sources of Ore

	1962	1961	1960
Broken Ore:			
Development.....	tons 314,801	tons 318,010	tons 574,992
Stoping.....	1,692,669	2,549,985	4,502,670
Total.....	2,007,470	2,866,995	5,077,662
Ore hoisted.....	2,069,560	2,837,191	5,044,188

Ore Reserves

	Milliken		Nordic	
	Ore	U ₃ O ₈ per ton	Ore	U ₃ O ₈ per ton
Proven ore.....	tons 632,000	pounds 2.22	tons 554,000	pounds 2.73
Probable ore as disclosed by underground development ⁽¹⁾	778,000	2.18	734,000	2.70
Probable ore as disclosed by diamond-drilling ⁽²⁾	8,587,000	2.34	4,880,000	2.56

⁽¹⁾Includes dilution based on experience, excludes permanent pillars.

⁽²⁾Tonnages and grades undiluted.

The average number of employees was: at Nordic, 615—331 underground, and 284 on surface; at Milliken, 540—298 underground, and 242 on surface. W. P. Arnold was general manager, G. M. Godfrey was mine manager at Nordic mine, and E. R. Olson was mine manager at Milliken mine.

Stanrock Uranium Mines Limited

Stanrock Uranium Mines Limited was incorporated in March 1956, with an authorized capitalization of 5,000,000 shares of \$1 par value. In 1958 the number of shares was increased to 6,000,000, of which 4,963,286 shares have been issued. The directors and officers were: George Rowe Jr., president and director; D. S. Robertson, vice-president and director; N. C. Steenland, V. V. Jacomini, J. C. Dunning, H. H. Merritt, J. C. Ward, James Bruce, and L. T. Norville, directors;

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Harmon Duncombe, secretary; D. C. Marshall, treasurer. The head office is at 80 Richmond Street West, Toronto. The mine address is Box 1700, Elliot Lake.

The property comprises twenty-two claims, about 595 acres in Township 144, Blind River area, District of Algoma.

Mining and milling operations continued throughout 1962.

SHAFTS, STANROCK MINE

	Claim No.	Inclination	Number of Compartments	Total Depth
No. 1 shaft	S.82324	Vertical	3	feet 3,379
No. 2 shaft	S.82323	Vertical	2	2,953
Service raise	S.82323	Vertical	3	220

The shafts are about 800 feet apart. There is a main level from No. 1 shaft at a depth of 3,277 feet, and a main level from No. 2 shaft at a depth of 2,909 feet. A connection between the two shafts was made in 1958. There are also two adits, one leading to each shaft, in a steep hillside near the shafts. The crushing and grinding equipment and a fine-ore bin are located in chambers excavated inside the hill. The crushing and grinding operation began on 15 February 1958.

Development work during the year consisted of 11,865 feet of drifting, 378 feet of crosscutting, 747 feet of conveyorways, and 162 feet of raising. Total development footage, to 31 December 1962, was as follows: 97,155 feet of drifts; 2,418 feet of crosscuts; 5,140 feet of conveyorways; 3,900 feet of raises. Some 1,600 diamond-drillholes, totalling 13,031 feet, were completed in 1962, from underground.

New equipment installed in 1962 included the following: 1 pump (SRL-C, 10 x 8 in., 1,600 gpm., 75-hp. motor, Allis-Chalmers) in mill; 2 slusher ramps (48 in., 30-hp. motor, capacity 100 tons/hr., Landis) underground; 4 fans (Vane-axial A3, 21 in., with 15-hp. motor, capacity 10,000 cfm., Canadian Blower and Forge) underground; 1 set friction hoist treads (14-ft. diameter, Canadian General Electric) for surface hoist.

A total of 1,059,448 tons of ore was hoisted; 1,060,163 tons was milled at a daily average of 2,900 tons.

The following is taken from the company annual report for the year ending 31 December 1962, reported by Montreal Trust Company, receiver and manager.

In September 1962, the company entered into a new contract with Eldorado Mining and Refining Limited for the delivery to Eldorado of further amounts of uranium oxide. The new Eldorado contract calls for the delivery of 2,886,105 pounds of uranium oxide, at a price per pound of approximately \$5.40 for the first 2,000,000 pounds and \$5.50 for the balance. Under the company's first Eldorado contract, the price per pound was approximately \$10.75. The company expects that deliveries under the first Eldorado contract will be completed in May 1963 and the deliveries under the new contract will commence then and continue to December 1964.

The average number of employees was 621: 400 underground, and 221 on surface. F. R. Jones was mine manager.

ZINC—see LEAD AND ZINC

Non-Metallics and Fuels

ARSENIC

In 1962, 160,750 pounds of arsenic valued at \$6,832 were recovered from concentrates shipped from the mines of the Cobalt-Gowganda area.

ASBESTOS

In 1962 asbestos production in Ontario increased 41.93 percent in quantity and 30.35 percent in value over the 1961 production.

The general statistics for asbestos, gypsum, nepheline syenite, peat moss, and talc are grouped together and published here. These industries paid \$646,061 to 103 salaried persons, and \$2,312,041 to 481 wage-earners. Fuel and electricity cost \$605,592, and process supplies cost \$362,078.

Canadian Johns-Manville Company Limited

Canadian Johns-Manville Company Limited was incorporated in September 1918. It is a wholly owned subsidiary of Johns-Manville Corporation. The authorized capitalization is 25,000 shares of \$100 par value, of which 15,705 shares have been issued. The directors and officers were: K. V. Lindell, chairman and director; A. G. Sinclair, president and director; L. M. Adamson, F. A. H. Gallop, N. W. Hendry, and J. O. Eby, vice-presidents and directors; W. H. Soutar, secretary; H. W. Clarkson, treasurer. The head office is at 310 Victoria Avenue, Westmount, Montreal 6, Que. The mine address is Matheson.

The company's holdings include twenty-six claims known as the Munro mine in Munro township, and the Barton Creek mine in Beatty township, Porcupine area, District of Cochrane.

Mining and milling at the Munro mine continued throughout 1962. All mill feed in 1962 came from underground mining.

SHAFTS, MUNRO MINE

	Claim No.	Inclination	Number of Compartments	Sinking in 1962	Depth Below Surface
				feet	feet
No. 1 main shaft	Veterans lot P.1152	Vertical	4	322	1,204
No. 1 service shaft	L.4510	Vertical	3	—	629
No. 3 shaft (below 637-foot level)	L.16365	Vertical	2	—	949

The No. 1 main shaft was sunk 322 feet in 1962 to a depth of 1,204 feet below surface. The 941-foot mine haulage and 997-foot crusher levels were established.

Development work in 1962 consisted of 2,415 feet of drifting; 1,658 feet of crosscutting; 698 feet of raising. The total development to 31 December 1962, was as follows: 1,843,528 tons of overburden stripped; 31,528 feet of drifts; 19,466 feet of crosscuts; 6,116 feet of raises. Diamond-drilling consisted of 68

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holes, totalling 13,052 feet, from underground. Blast-hole stoping to slusher drifts continued to be the mining method employed, but during the year mucking-machine drawpoints replaced the slusher drifts in No. 6 west stope while being readied for production. This replacement will be standard in all future stoping. The drive westerly from the 635-foot level toward the Barton Creek and Beatty areas was steadily advanced. The B-1 zone encountered in this drive was extensively diamond-drilled. Mill alterations are complete, but certain modifications and additions in the dust collecting system were in progress. A third packaging unit was added to handle all mill production in pressure-packed form. Two grades of asbestos fibre were produced during the year.

New construction consisted of a hydraulic pressure units room (24 x 14 x 10 ft., concrete foundation, steel, with transitile cover).

The following equipment was added:

- 2 tailings conveyor extensions (24 ins. wide, 128 and 50 ft. long, Forano).
- 1 impact crusher (AP-4, Hazemag).
- 2 fibre-cleaning trommels (58 x 150 ins., Forano).
- 1 package conveying system (Hall Machinery).
- 1 hydraulic-pressure packer (for 15-x 7.5-x 34-in. package, Hall Machinery, St. Regis and Vickers).
- 1 collector (6-ft. diam. with airlock and fan, company design).
- 2 sifters (7-deck, Model-HBEF, Canadian Allis-Chalmers).
- 1 fork-lift truck (Model-460, Towmotor Corp.).
- 1 battery locomotive (3 ton).
- 1 combination locomotive (10 ton, Goodman).
- 2 air slushers (15-hp., Joy Mfg. Co.).
- 4 loaders (LM 250, Copco).
- 1 rocker shovel (Model 21 Eimco).
- 1 loading pocket (120-cu. ft., Dorr-Oliver-Long).
- 1 brow pocket, (Wabi Iron Works).

There were 887,092 tons of ore hoisted from underground, from which 207,367 tons was discarded. The mill treated 647,957 tons, operating at an average daily rate of 2,300 tons.

The average number of employees was 332: 110 underground, and 222 on surface. R. W. Winson was mine manager.

Hedman Mines Limited

Hedman Mines Limited was incorporated in August 1956, with an authorized capitalization of 3,000,000 shares of \$1 par value, of which 1,288,203 shares have been issued. The directors and officers were: J. J. Mangan, president and managing director; J. C. Lavigne, vice-president and director; S. E. McCrory, secretary-treasurer and director; A. H. Stanley and G. T. Evans, directors. The head office address is Box 467, Timmins. The mine address is Matheson, P.O. Box 336.

The property comprises twenty-nine claims about 1,164 acres, located in Warden and Munro townships, District of Cochrane, about 25 miles northeast of Matheson. The open pit is located near the centre of the Warden township property; the pilot plant is on the railway siding at Matheson.

Operations continued throughout 1962 and consisted of further stripping of the asbestos orebody, the improvement of the access road to highway No. 101, and intermittent operation of the pilot plant for bulk testing. Surface trenching, some 300 feet in length, averaging 8 feet in depth, was completed. Surface diamond-drilling consisted of one hole 200 feet in length.

The 40-ton pilot plant was completed in February, and an intensive testing program was carried out for the remainder of the year. A new asbestos circuit was designed, and samples were distributed for customer appraisal. Designing of the production plant is almost completed, and present plans call for construction to start in 1963.

New equipment added consisted of:

- 1 fiberizer with electrical control system.
- 1 electric blower heater.
- 1 commercial vacuum cleaner.
- 1 platform scale.
- 1 puller (3-ton).
- 3 electric motors (3-, 5-, and 10-hp.).

E. W. Gagan was consulting engineer in charge of operations at the property, and 10 men were employed.

FLUORSPAR

There was no fluorspar produced in Ontario in 1962.

Huntingdon Fluorspar Mines Limited

Huntingdon Fluorspar Mines Limited was incorporated in June 1953, with an authorized capitalization of 40,000 preferred shares of \$10 par value and 500,000 common shares of no par value. The number of shares issued at 31 December 1961 was as follows: preferred, 750; common, 100,003. The directors and officers were: W. J. Symon, president and director; Mrs. Alein Symon, vice-president, secretary-treasurer, and director; Mrs. Jane Parker, director. The head office and plant address is Madoc.

The construction of a processing and briquetting plant, located to the north of North Brook on highway No. 41, was completed in 1962. The plant will prepare fluorspar ore, shipped from Mexico for flux, used chiefly in the steel industry.

The construction of a crushing plant for the production of marble chips, used in the terrazzo industry, was also commenced in 1962.

W. J. Symon, president, was in charge, and six men were employed during the period of operation.

GARNET

There was no garnet produced in Ontario in 1962.

Industrial Garnet Company Limited

Industrial Garnet Company Limited, was incorporated in March 1958, with an authorized capitalization of 50,000 common shares of no par value and 20,000 5 percent preferred shares of \$10.00 par value; 2,796 common and 8,815 preferred shares have been issued. The officers and directors were: H. F. Wiemer, president, director and manager; Mrs. I. J. I. Wiemer, vice-president and director; R. W. Wiemer, secretary-treasurer and production manager. The head office and mine address is River Valley.

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The company's property consists of seventeen claims, about 540 acres, located in Dana, Crerar, McWilliams, and Gibbons townships, District of Nipissing.

Operations were continued in 1962. The company primarily produces stucco pebbles from the black granite open-cut operations in the several townships near the mill. Two diamond-drillholes, totalling 218 feet, were completed from surface in 1962.

Construction included the completion of the second crushing and screening plant and the storage sheds with a total floor area of 7,500 square feet, both commenced in 1961. Equipment was installed to give a 60-ton per day milling capacity. Two exhaust fans were located in the crushing plant, and a bulldozer-loader (John Deere 440) was purchased.

The mill was operated intermittently for a total of 160 days in 1962 and treated 2,700 tons of material, mined in the open pit.

The average number of employees was 6.

GYPSUM

Production of gypsum in Ontario in 1962 showed an increase of 2.31 percent in quantity and 1.60 percent in value over the 1961 production.

General statistics for the industry are included under ASBESTOS.

Canadian Gypsum Company Limited

Canadian Gypsum Company Limited was incorporated in September 1907. The authorized capitalization was 3,000 shares of \$100 par value, of which 2,710 shares have been issued. The directors and officers were: C. H. Shaver, president and director; G. A. Long and Edward Rembert, vice-presidents and directors; D. C. McConkey, secretary, treasurer, and director; Beverley Matthews, director; W. G. Parsons, T. R. McCleary, and R. L. Jackson, vice-presidents. The head office is at 790 Bay Street, Toronto. The mine address is Hagersville.

The company operates a gypsum mine and plant in lots 14 and 15, concession IV, Oneida township, Haldimand county. The company own, or hold the mining rights on about 2,623 acres.

The mine is operated through the three-compartment, No. 1 vertical shaft, 102 feet deep, in lot 15. There is a vertical two-compartment ventilation and escapement shaft, 90 feet deep, known as No. 2 in lot 15. In 1959, No. 3 vertical, two-compartment, ventilation and escapement shaft was completed at a depth of 85 feet below the collar in lot 14. The room-and-pillar method of mining is used.

The mine and mill operated throughout 1962.

A total of 286,510 tons of ore was hoisted, 275,503 tons was milled; the mill averaged 1,070 tons daily.

The average number of employees, excluding the mill was 77: 61 underground, and 16 on surface. C. F. Gloeckner was works manager; Norman Miller was mine superintendent.

**Domtar Construction Materials Limited
(Gypsum Products)**

Gypsum, Lime and Alabastine, Canada, Limited was incorporated in July 1927; in May 1956, the capitalization was increased. The company became a wholly owned subsidiary of Dominion Tar and Chemical Company Limited in February 1959, and in March 1961 the name was changed to Domtar Construction Materials Limited (Gypsum Products). The head office is at 2100 Sun Life Building, Montreal 2, Que. The executive office is at 50 Maitland Street, Toronto. The mine address is Caledonia.

The company has two gypsum properties comprising 3,520 acres, of which 675 acres has been proven mineable, and a mill in Seneca township, Haldimand county. The old mine, in lot 10, range 1 west, has been abandoned. Operations at the new mine, in lot 8, range 2 west, continued throughout 1962. The room-and-pillar method of mining is used; this consists of rooms or pockets, leads, and crosscuts, all approximately 21 feet in width by 8.5 feet in height. A ton of gypsum ore in place is equivalent to about 13.7 cubic feet. Each foot of advance produces an average of 13.3 tons of gypsum. The total advance in 1962 was 12,947 feet.

During the year a total of 159,223 tons of ore was hoisted; 111,017 tons was milled. The mill averaged 560 tons daily.

The average number of employees, excluding the mill, was 27: 24 underground, and 3 on surface. C. L. Dryden was general manager; G. R. Hunt was mine superintendent.

**Western Gypsum Products Limited
(Oxford Mine)**

Western Gypsum Products Limited was incorporated in August 1929, with an authorized capitalization of 1,500,000 preferred shares of \$1 par value and 100,000 shares of no par value; 779,566.5 of the preferred shares, and 49,685 shares of no par value have been issued. The directors and officers were: G. S. Thorvaldson, chairman and director; D. V. Damerell, president and director; N. W. Puttock, executive vice-president and director; R. C. Blair, vice-president, production manager, and director; G. H. Horner, vice-president, secretary-treasurer, and director; H. N. Butler, R. S. Jukes, and T. O. Peterson, directors. The head office is at 306 Electric Railway Chambers, 213 Notre Dame Avenue, Winnipeg 2, Manitoba. The mine address is Clarkson, 2650 Lakeshore Highway.

The company's property, the Oxford mine, comprises 1,000 acres located in Blenheim township, County of Oxford. A diamond-drilling program, carried out in 1961, outlined a gypsum deposit in the area west of Drumbo. A recently developed long-hole drilling method was used to penetrate the zones of water-bearing sands in the overburden and the rock strata, to sink No. 1 shaft in 1961 to a depth of approximately 400 feet in lot 21, concession 6, Blenheim township.

During January 1962, two miners were employed to remove a 75-ton bulk sample from the gypsum horizon intersected in No. 1 shaft. The sample was shipped to Winnipeg for testing in the laboratory and plant of the company.

R. C. Blair, vice-president (production), was in charge.

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MICA

The quantity of mica produced in 1962 was more than two-and-one-half times that of 1961, but the value of the product was about two-thirds the 1961 value. The 1961 production included a considerable amount of trimmed sheets, and splittings, and the 1962 production was back in the usual category of scrap for grinding. There are no figures available for employment and supplies because the operations were all carried out by individuals.

MINERAL WATER

One operator, Breuvages Excel Limitée, in Russell county, processed 5,200 gallons, valued at \$2,780. There are no figures available for employment or supplies used.

NATURAL GAS AND PETROLEUM

Production of natural gas increased 7.59 percent in quantity and 3.34 percent in value over that of 1961.

Production of petroleum decreased 1.31 percent in quantity but the value of production increased 3.22 percent.

Full details of these industries are found in the 1962 report of the Department of Energy Resources.

NEPHELINE SYENITE

Production increased 5.86 percent in quantity and 1.28 percent in value over 1961. General statistics for the industry are included in those given under ASBESTOS.

Indusmin Limited

American Nepheline Limited was incorporated in January 1945; in 1961 the name was changed to Industrial Minerals of Canada Limited; in 1962 to Indusmin Limited. It is a wholly owned subsidiary of Industrial Minerals of Canada Limited. The authorized capitalization is 1,000,000 shares of no par value, of which 410,000 shares have been issued. The directors and officers were: H. J. Fraser, president and director; J. J. Mather, executive vice-president and director; F. D. Hart, R. C. Mott, and W. H. Woods, directors; J. T. McWhirter, treasurer; D. D. Anderson, secretary. The head office is at 7 King Street East, Toronto. The mine address is Nephton, via Lakefield.

The property consisting of approximately 2,424 acres, is located in concession IX, Methuen township, County of Peterborough.

Operations continued throughout 1962 in the open pit on the Cabin Ridge section of the property. Some 1,040 feet of rock trenching averaging 2 feet in depth was completed. New construction consisted of a boiler house (16 x 28 ft., Armco metal).

A total of 190,900 tons of ore was mined, of which 190,404 tons was milled. The mill averaged 762 tons daily.

The average number of employees was 73: 60 in the plant, and 13 in the pit. E. B. Wright was general manager.

**International Minerals and Chemical Corporation
(Canada) Limited**

Canadian Flint and Spar Company Limited was incorporated in March 1930. In December 1955, the name was changed to International Minerals and Chemical Corporation (Canada) Limited. The company is wholly owned by International Minerals and Chemical Corporation, Old Orchard Road, Skokie, Illinois, U.S.A. The directors and officers were: T. M. Ware, president and director; N. J. Dunbeck, L. W. Gopp, G. B. Hamilton, D. J. Stark, and J. D. Zigler, vice-presidents and directors; R. A. Lenon, treasurer, controller, and director; N. C. White and Louis Ware, directors; C. M. Edwards, secretary; B. R. Carlson, assistant controller; C. E. Gable and J. W. York Jr., assistant secretaries. The head office is at 4 King Street West, Toronto 1. The mine address is Box 309, Havelock.

The company owns six claims, about 400 acres, in Methuen township, County of Peterborough. The present operation is in lots 19, 20, and 21, concession VI, at the northeast end of Blue Mountain. The property is known as the Blue Mountain nepheline syenite mine.

Mining and milling continued throughout 1962. Some 1,000 feet of surface-trenching, averaging 2 feet in depth, was completed.

New equipment installed included: a rod mill (12 x 6 ft., capacity 10 tons per hour, Canadian Allis-Chalmers, Lachine, Que.); 4 Hum-Mer screens (10 x 4 ft., W. S. Tyler, St. Catharines); 2 Dings magnetic separators (36 in., capacity 6 tons per hour, J. F. Comer, Toronto); a bucket elevator (7 x 16 in., capacity 75 tons per hour, Jeffrey Mfg., Toronto); a screw conveyor (24 in., capacity 75 tons per hour, Jeffrey Mfg., Toronto).

The open-pit operation produced 190,348 tons, from which 40,363 tons was discarded. The mill treated 149,985 tons, averaging 620 tons daily.

The average number of employees was 46: 40 in the plant and 6 in the pit. L. F. McDonnell was manager.

PEAT MOSS

Atkins and Durbrow (Erie) Limited operated in Welland county, gathering material from 1 May to 31 October, and operating their plant from 2 January to 21 December.

Amaranth Peat Products operated in Dufferin county from June to September.

The product was used for horticultural purposes and for litter for livestock.

General statistics for the industry are included in those given under ASBESTOS.

PETROLEUM—see NATURAL GAS AND PETROLEUM

QUARTZ

The mines of the Sudbury district produced, from their own pits and quarries, 1,183,465 tons of quartz and fluxing sand for use in their smelter operations.

The industry paid \$68,005 to 11 salaried employees and \$217,395 to 67 wage-earners. Fuel and electricity cost \$56,768, and process supplies cost \$53,266.

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SALT

Production of salt in 1962 increased 10.29 percent in quantity and 13.25 percent in value over the 1961 production. Brine operations were carried out throughout the year in Essex county by Brunner Mond Canada Limited, Canadian Brine Limited and Canadian Salt Company Limited; at Sarnia by Dow Chemical of Canada Limited and Domtar Chemicals Limited, Sifto Salt Division; and at Goderich by Domtar Chemicals Limited, Sifto Salt Division.

The industry paid \$584,757 to 97 salaried employees and \$2,350,635 to 473 wage-earners.

Fuel and electricity cost \$770,656, and process supplies cost \$631,036.

Canadian Rock Salt Company Limited

Canadian Rock Salt Company Limited was incorporated in September 1952, with an authorized capitalization of 50,000 shares of no par value, of which 5,162 shares have been issued. The directors and officers were: Daniel Peterkin Jr., president and director; N. C. Hobson, executive vice-president and director; W. D. Mahaffy, vice-president and director; H. A. Clarke, vice-president, secretary-treasurer, and director; F. B. Common Jr, F. M. Sobey, E. G. Smith, H. R. Stratford, R. C. Vail, and L. M. McBride, directors; J. D. Mair, vice-president. The head office is at 30 Prospect Avenue, Windsor. The mine address is Ojibway.

The company's property is in concession 1, Sandwich West township, Essex county, on the shore of the Detroit River.

Operations continued throughout 1962.

SHAFTS, CANADIAN ROCK SALT MINE

	Inclination	Number of Compartments	Total Depth
No. 1 shaft	Vertical	4	feet 1,082
No. 2 shaft	Vertical	3	1,025

Production remained at a high level throughout the year. The first and last quarters were particularly demanding since a large portion of the salt destined for ice-control uses, moves during these periods. The fluctuation in industrial demand is not so pronounced, remaining fairly constant at all times. The Ojibway mine, which produces rock salt for both the domestic and export markets, continued its program of expanding production facilities. Although no new equipment was installed during the year, the underground development program was accelerated to provide space for an extension of existing conveying and crushing equipment.

The salt from the rooms is transported by truck to No. 2 crushing station. This station is located 2,000 feet from the production shaft. To keep pace with the rapidly advancing faces, an additional permanent conveying system 2,500 feet in length will be installed to augment the present units. This will result in shorter trucking hauls, and will provide an advanced crusher station that will serve the mining faces for some years to come. This is the third station to be provided in the past seven years. The additional length of conveyor will also act as an added short-storage area in the production cycle.

The underground mining pattern of room-and-pillar advance with faces to a 20-foot height continues. The recovery factor of 50 percent remains unchanged, and the practice of leaving 6 feet of salt on the roof to lend continuity to the pillar support has proven most successful.

Development work in 1962 on the 975-foot level consisted of: 3,957 feet of drifting, 6,065 feet of crosscutting, and 9,879 feet of rooms. Total development footage, to 31 December 1962, was as follows: 41,657 feet of drifts; 30,265 feet of crosscuts; 74,604 feet of rooms.

A total of 1,027,332 tons of salt was hoisted and milled. The mill treated a daily average of 3,592 tons.

The average number of employees was 148: 84 underground, and 64 on surface. W. M. Rice was mine manager.

**Domtar Chemicals Limited
(Sifto Salt Division, Goderich Mine)**

Astrea Company Limited was incorporated in March 1956, under Dominion charter. In December 1956, the name was changed to Dominion Rock Salt Company Limited; in July 1959, to Sifto Rock Salt Limited; in 1960, to Sifto Salt (1960) Limited; and in 1962, to Domtar Chemicals Limited, Sifto Salt Division, Goderich Mine. The company is a wholly owned subsidiary of Dominion Tar and Chemical Company Limited. The head office is at 2240 Sun Life Building, Montreal, Que. The mine address is Goderich, Box 910.

Operations continued throughout 1962.

SHAFTS, SIFTO SALT DIVISION, GODERICH MINE

	Inclination	Number of Compartments	Sinking in 1962	Total Depth
No. 1 shaft	Vertical	3	feet 1,326.5	feet 1,867.5
No. 2 shaft	Vertical			1,417

Late in 1961 a start was made on the sinking of No. 2 shaft. This was continued in 1962, and at the year's end a depth of 1,417 feet below surface had been reached. The shaft is circular in shape, 16 feet in diameter, and is to be concrete lined for its full depth. No separate compartments are being established during sinking, and at present it is not planned to install a conveyance in this shaft. When completed it will provide a fresh-air inlet and an auxiliary escapeway from the mine.

Mining is carried out by the room-and-pillar method on the 1,760-foot level. Original headings were excavated 18 feet high and 60 feet wide. Later a large drill jumbo was used to increase the excavation height to 45 feet. Pillars are 210 feet square, giving an extraction ratio of 40 percent.

The production rate of rock salt and the tonnage shipped during 1962 was the highest in the history of the company. A program of surface expansion was started to provide additional storage facilities and to increase screening capacity in line with the production from the underground mill installed during the previous year. New construction consisted of the following: a salt storage building (86 x 76 ft., concrete and asbestos, capacity 1,500 tons); the existing timber screening building was increased in height by 35 feet; two concrete storage silos (40-ft. diameter, 90 ft. high, having a capacity of 3,200 tons each).

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The following was added new equipment:

- 4 Rotex Screeners (3-deck, 350 ton per hour, Orville-Simpson Co.).
- 4 36-inch belt conveyors (36-in., 350 ton per hour, United Steel Corp.).
- 2 30-inch belt conveyors (30-in., 250 ton per hour, United Steel Corp.).
- 1 Vibrex feeder (250 ton per hour, Hewitt Robins).
- 1 Trump Giraffe mounted on a Diamond T truck was added to the underground equipment.

Development footage in 1962 consisted of 7,270 feet of drifting. Total development footage, to 31 December 1962, was as follows: drifts, 23,969 feet, 220 feet of which has been for ventilation; raises, 108 feet.

A total of 1,013,880 tons of ore was milled underground, from which 183,595 tons was discarded; 824,085 tons was hoisted for further processing. The average daily milling rate was 3,229 tons.

The average number of employees was 131: 69 underground, and 62 on surface. The shaft contractor, The Cementation Company (Canada) Limited, employed an additional average of 48 men in the sinking of No. 2 shaft. W. G. Muir was mine manager.

SULPHUR

The value of sulphur produced in 1962 was 11.14 percent greater than the value of the 1961 production. Some elemental sulphur is recovered, but the greater part of Ontario's production represents the sulphur content of liquid sulphur dioxide and sulphuric acid manufactured from smelter gases in the Sudbury area. There is recovery made also in the latter two forms in the refining of concentrates from the Manitouwadge area.

General statistics for the production of sulphur are included in those given under NICKEL AND COPPER.

SULPHURIC ACID PLANTS

Canadian Industries Limited

The new No. 2 sulphuric acid plant of Canadian Industries Limited commenced operation in March 1958. It was constructed to produce sulphuric acid from the stack gas of International Nickel Company's iron ore recovery plant. The No. 1 and No. 2 sulphuric acid plants, and the liquid sulphur dioxide plant, are located at Copper Cliff. Operations continued throughout 1962 for all three plants.

No. 1 plant produced 34,914 tons of acid, averaging 96 tons daily.

No. 2 plant produced 103,265 tons of acid, averaging 283 tons daily.

The liquid sulphur dioxide plant produced 82,515 tons.

The average number of employees was 92. A. A. Perley was works manager.

Cutler Acid Limited

Cutler Acid Limited was incorporated in October 1962, with an authorized capitalization of 20,000 shares of \$100 par value, of which 18,500 shares have been issued. The company officers were as follows: W. T. D. Ross, president; J. D. Wright, vice-president; R. W. Allgood, general manager; L. A. Wheable secretary; E. H. Kemp, treasurer. The head office is at 130 Bloor Street West, Toronto. The plant address is Cutler.

The company, controlled by Canadian Industries Limited, took over the Sulphuric Acid Division (Cutler Plant) from Noranda Mines Limited, who operate it under a management agreement. The plant, located on the north shore of Lake Huron in the Serpent River Indian Reserve, is in Lewis township, District of Algoma.

Operations continued throughout 1962, with approximate production as follows:

Sulphuric acid (60°B 100 percent).....	net tons	100,000
Iron sinter.....	long tons	14,000
Iron calcine.....	long tons	30,000

The average number of employees was 93. W. Seniuk was plant manager.

TALC

Production increased 8.96 percent in quantity and 18.81 percent in value over that of 1961. General statistics for the industry are included in those given under ASBESTOS.

Canada Talc Industries Limited

Canada Talc Industries Limited was incorporated in July 1951, with an authorized capitalization of 1,300,000 shares of no par value, of which 950,174 shares have been issued. The officers were: H. L. Roscoe, president; N. C. Urquhart and A. D. Dickson, vice-presidents; C. H. Windeler, secretary-treasurer. The head office and mine office are at Madoc.

The company's property in Huntingdon, Elzevir, and Madoc townships, County of Hastings, comprises six lots and includes the Conley and Henderson mines.

Operations continued throughout 1962. Mining is through No. 2 shaft of the Conley mine, and No. 3 shaft of the Henderson mine.

SHAFTS, CANADA TALC PROPERTIES

	Location	Inclination	Number of Compartments	Total Depth from Surface
				feet
CONLEY MINE				
No. 1 shaft (inactive).....	Huntingdon twp. lot 15, con. XIV	Vertical	2	431
7th level winze (below 420 feet) (inactive).....	lot 15, con. XIV	Vertical	2	451
Escapement raise (inactive)	lot 15, con. XIV	Vertical	1	185
No. 2 shaft.....	lot 15, con. XIV	Vertical	3	420
HENDERSON MINE				
No. 3 shaft.....	Huntingdon twp. lot 14, con. XIV	Vertical	2	456

Development work in 1962 consisted of: 100 feet of drifting, 40 feet of cross-cutting, and 25 feet of raising. Total development footage, to 31 December 1962, was as follows: 14,072 feet of drifts; 4,167 feet of crosscuts; 3,793 feet of raises. Three diamond-drillholes, totalling 334 feet, were completed from underground.

A total of 12,966 tons of ore was hoisted: 920 tons was discarded; 190 tons was sold as crude talc; 11,857 tons was milled at an average of 50 tons daily.

The average number of employees was 17: 8 underground, and 9 on surface. H. E. Roscoe was manager.

Structural Materials

CEMENT

Production of cement increased 12.74 percent in quantity and 8.50 percent in value over the 1961 production.

Canada Cement operated quarry and plant at Woodstock throughout the year; plant and quarry at Port Colborne from 6 June to 9 November; and at Belleville, the quarry from 24 January to 31 December, and plant from 1 February to 31 December.

Lake Ontario Portland Cement Company Limited operated at Picton; the quarry from 7 February to 31 December, and the plant throughout the year.

St. Lawrence Cement Company operated at Clarkson; the quarry from 9 March to 30 November, and the plant throughout the year.

St. Mary's Cement Company Limited operated quarry and plant at St. Mary's throughout the year.

The industry paid \$1,190,376 to 183 salaried employees and \$4,637,504 to 831 wage-earners. Fuel and electricity cost \$6,676,327, and process supplies cost \$1,915,300.

CLAY PRODUCTS

The value of clay products manufactured in 1962 was 5.83 percent greater than in 1961. There were 51 operators with 55 plants. They paid \$1,082,219 to 211 salaried employees and \$6,069,391 to 1,601 wage-earners. Fuel and electricity cost \$3,164,860, and process supplies cost \$637,550.

CLAY PRODUCTS MARKETED, 1962

Kind	Quantity	Value
Brick:		
Soft-mud process {face.....M	40,669	\$ 2,169,077
{common.....M	5,954	141,865
Stiff-mud (wire-cut) process {face.....M	171,854	8,740,925
{common.....M	14,618	342,085
Dry-press {face.....M	10,689	551,625
{common.....M	715	15,144
Fancy or ornamental brick (including special shapes, embossed and enamelled brick).....M	9,982	831,218
Sewer.....M	1,046	41,654
Tile:		
Structural (hollow blocks, including fireproofing and load-bearing tile)..... tons	42,839	927,112
Floor tile..... sq. ft.	856,197	99,397
Drain..... M	47,429	2,729,705
Sewer pipe..... feet	2,310,500	1,110,672
Pottery from domestic clay.....		680,388
Flue linings..... feet	829,940	632,276
Other products.....		1,133,643
Total.....	————	\$20,146,786

LIME

Production of quicklime increased 5.45 percent in quantity and decreased 11.64 percent in value from 1961. Production of hydrated lime increased 4.02 percent in quantity and 4.75 percent in value over 1961.

There were 11 operators with 13 plants and 52 kilns in use. The industry paid \$294,875 to 60 salaried employees and \$1,648,612 to 387 wage-earners. Fuel and electricity cost \$1,856,038, and process supplies cost \$262,941.

The following operated throughout the year:

Bonnechere Lime Limited, Gratton township, Renfrew county.
 Brunner Mond Canada Limited, Amherstburg.
 Canadian Gypsum Company Limited, Guelph.
 Chemical Lime Limited, Ingersoll.
 Cyanamid of Canada Limited, Ingersoll.
 Cyanamid of Canada Limited, Niagara Falls.
 Dominion Magnesium Limited, Haley.
 Domtar Chemicals Limited, Gypsum Lime Division, Beachville.
 Domtar Chemicals Limited, Gypsum Lime Division, Hespeler.
 Rockwood Lime Company Limited, Rockwood.

Carleton Lime Products Company operated at Carleton Place between 7 April and 27 November; Canada and Dominion Sugar operated for 79 days at the Chatham kiln, and Indusmin Limited operated at Coboconk for 101 days.

LIME, 1962

Industrial Consumption	Quicklime		Hydrated Lime	
	Quantity	Value	Quantity	Value
	tons		tons	
Building trades, finishing, and masonry.....	15,958	\$ 231,964	68,405	\$1,471,689
Agriculture.....	65	776	1,093	15,271
Industry:				
Smelters.....	2,237	25,457	2,026	28,828
Iron and Steel.....	163,659	1,856,270	971	14,210
Gold milling.....	6,823	85,240	1,575	22,651
Uranium milling.....	96,381	1,194,264	174	2,386
Pulp and paper.....	32,458	280,174	1,736	24,505
Glass.....	7,683	109,042		
Sugar.....	5,652	35,654	810	7,378
Tanneries.....	790	9,037	3,250	47,155
Fertilizers and insecticides.....	177,232	1,999,264	1,092	21,159
Chemical industries.....	261,933	2,275,213	27,413	413,836
Other consumers.....	31,514	356,487		
Total.....	802,385	\$8,458,842	108,545	\$2,069,068

SAND AND GRAVEL

Production of sand and gravel increased 9.10 percent in quantity and 29.79 percent in value over 1961 production. There were 311 reporting pit operators and 10 reporting dredge operators. The industry employed 246 salaried personnel and paid them \$1,171,452, and 1,695 wage-earners and paid them \$6,359,640.

Fuel and electricity cost \$2,135,700, and process supplies cost \$475,320.

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OUTPUT OF SAND AND GRAVEL

Source	1958	1959	1960	1961 ⁽¹⁾	1962
Private pit operators..... tons	31,853,372	34,559,281	34,670,825	30,905,527	37,742,342
\$	23,514,262	24,520,143	24,254,713	21,237,199	27,102,169
Dredged from the Great Lakes and rivers..... tons	1,263,381	1,306,943	1,163,678	1,123,897	1,074,148
\$	1,421,628	1,616,294	1,490,251	1,380,597	1,257,201
Ontario Department of Highways..... tons	21,077,081	24,776,179	26,303,751	24,395,141	21,123,800
\$	8,460,000	7,226,546	10,521,500	10,977,813	15,842,850
Counties and townships... tons	11,816,303	11,919,781	14,281,959	12,214,371	14,820,156
\$	5,908,152	5,959,891	7,140,980	6,107,186	7,410,078
Railway ballast..... tons	1,458,927	1,419,519	1,240,620	1,569,263	1,840,367
\$	750,989	372,728	522,264	641,276	752,906
Total..... tons	67,469,064	73,981,703	77,660,833	70,208,199	76,600,813
\$	40,055,031	39,695,602	43,929,708	40,344,071	52,365,204

⁽¹⁾Revised figures.

STONE

Production of stone increased 2.37 percent in quantity and 6.59 percent in value over the 1961 production. There were 84 operators working about 105 quarries. The industry paid \$1,097,784 to 237 salaried employees, and \$4,952,223 to 1,263 wage-earners. Fuel and electricity cost \$1,410,325, and process supplies cost \$2,293,050.

OUTPUT OF STONE

Variety	1958	1959	1960	1961 ⁽¹⁾	1962
Limestone..... tons	15,144,361	16,322,071	16,118,571	16,654,878	17,279,797
\$	18,542,922	19,363,443	18,782,082	19,242,067	19,892,022
Marble..... tons	33,989	51,440	40,423	33,929	34,926
\$	301,135	327,644	356,762	309,628	288,480
Trap and granite..... tons	550,362	882,236	1,695,446	1,647,655	1,448,916
\$	1,265,996	1,811,344	3,631,262	3,515,601	4,318,067
Sandstone..... tons	27,848	33,049	84,143	25,381	34,009
\$	560,427	550,994	450,553	425,796	544,981
Total..... tons	15,756,560	17,288,796	17,938,583	18,361,843	18,797,648
\$	20,670,480	22,053,425	23,220,659	23,493,092	25,043,550

⁽¹⁾Revised figures.

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