Box #2

ONTARIO

DEPARTMENT OF MINES

HON. G. C. WARDROPE, *Minister* D. P. DOUGLASS, *Deputy Minister*

Statistical Review of the Mineral Industry for 1960

By

T. J. KELLY

combined with

Mining Operations in 1960

By

G. S. RIDDELL

Annual Report, Volume LXX

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 Seventieth 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, 1962.

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Statistical Review of the Mineral Industry for 1960

By T. J. Kelly[1]

Mining Operations in 1960

By G. S. Riddell[2]

NOTE—Previous to 1960, the Statistical Review of the Mineral Industry, and Mining Operations, were published separately as Part 1 and Part 2, respectively. These have now been combined into a single Annual Report. This report includes general statistical material concerning the mineral industry as a whole, the number of employees connected with the industry, and the total values of metallics, non-metallics, and structural materials produced and shipped. Mining Operations refers to the reports submitted by individual companies that have reported actual mining or development operations for the year.

GENERAL SUMMARY

MINERAL PRODUCTION

The value of mineral production in Ontario in 1960 was slightly greater than in 1959. It increased by $2,500,000, which was 0.26 percent of the 1959 value. The value of metallic minerals increased by 1.46 percent, which was $11,790,000.

The Sudbury district once again led all other areas in value of production of metallic minerals. The value of metallics in this area increased 18.60 percent to $428,175,000, which was 52.31 percent of the province's total metallics value. The Blind River area accounted for 23.85 percent of this total, the Rainy River–Kenora (Patricia Portion) area for 4.95 percent, the Porcupine area for 4.52, Thunder Bay for 4.51, Kirkland Lake–Larder Lake for 3.85, Eastern Ontario for 3.10, Algoma for 1.79, and the Cobalt area for 1.12 percent.

The non-metallic minerals decreased 22.48 percent from the 1959 value, structural materials[3] increased 0.51 percent in value.

Metallics made up 83.26 percent of the total value of mineral production, non-metallics 3.48 percent, and structural materials 13.26 percent.

During the year the metal mines paid out $72,494,899 in dividends.

The Emergency Gold Mining Assistance Act was in force throughout the year, and 23 gold producers received assistance.

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[1]Statistician, Ontario Department of Mines.
[2]Engineer of Mines, Ontario Department of Mines.
[3]Commencing with this volume, Structural Materials combines the former categories Structural Materials and Clay Products.

Summary of Mineral Statistics, 1960

Product	Quantity	Value	Percent Total Canadian Value	Wage-Earners[1]	Wages
Metallic					
Gold ..... oz.	2,732,673	$ 92,774,248	59.03	10,669	$ 39,909,792
Silver ..... oz.	11,220,823	9,976,434	32.98	573	2,136,315
Copper in matte exported ..... lb.	40,451,599	11,043,287	46.72		
Copper, metal and concentrates ..... lb.	372,092,929	112,706,948			
Nickel, matte, metal and salts ..... lb.	403,300,283	277,924,234	94.01		
Platinum metals ..... oz.	483,585	28,871,955	99.99	19,733	97,087,361
Selenium ..... lb.	144,500	1,011,500	27.70		
Tellurium ..... lb.	7,450	26,075	16.67		
Pyrrhotite	—	762,661	23.00		
Cobalt, metal and salts ..... lb.	3,258,401	6,312,921	93.34	(2)	(2)
Iron ore ..... tons	5,325,197	48,399,442	27.64	2,359	13,033,614
Calcium ..... lb.	134,801	159,241	100.00	(3)	(3)
Magnesium ..... lb.	14,577,138	4,313,987	100.00		
Lead ..... lb.	1,661,896	177,490	0.40	626	3,138,041
Zinc ..... lb.	90,459,368	12,076,326	11.11		
Uranium (U_3O_8) ..... lb.	19,793,727	211,983,533	78.53	6,079	36,166,044
Bismuth ..... lb.	37,835	45,402	5.96	(3)	(3)
Total	—	$818,565,684	58.74	40,039	$191,471,167
Non-Metallic and Fuels					
Arsenic trioxide ..... lb.	1,724,326	70,400	100.00	(3)	(3)
Mica, amber ..... lb.	345,777	5,745	6.10	—	—
Mineral water ..... gals.	2,626	1,890	0.94	—	—
Natural gas ..... M cu. ft.	16,987,056	6,573,990	12.59	not available	not available
Petroleum ..... bbls.	1,005,030	3,150,065	0.74		
Quartz ..... tons	1,659,410	998,281	30.56	60	118,229

Salt	tons	3,007,599	13,994,545	72.30	430	2,028,213
Sulphur[4]		———	985,717	13.78	(5)	(5)
Asbestos	tons	23,284	4,128,920	3.40		
Fluorspar		———	100,811	5.24		
Garnet	tons	32	4,480	100.00		
Gypsum	tons	355,603	871,408	9.17	401	1,887,164
Nepheline syenite	tons	240,636	2,891,095	100.00		
Peat moss	tons	13,566	338,614	5.56		
Talc	tons	7,189	102,645	19.62		
Total		———	34,218,606	5.28	891	4,033,606

Structural Materials

Cement	tons	2,007,044	30,699,800	32.92	875	4,258,687
Hydrated lime	tons	104,350	2,035,818	63.61	448	1,940,088
Quicklime	tons	885,738	10,242,812			
Sand and gravel	tons	77,660,833	43,929,708	39.52	1,786	6,749,955
Stone	tons	17,938,583	23,220,659	38.29	1,288	4,977,691
Clay Products:						
Brick, face	M	205,361	11,734,214			
Brick, common	M	33,138	1,080,471			
Brick, fancy and ornamental, special glazes	M	590	81,459			
Brick, sewer	M	1,061	42,496	52.82	1,613	5,935,300
Tile, drain	M	51,637	2,954,594			
Tile, structural, roofing, and floor		———	1,168,631			
Sewer pipe, copings, flue-linings, etc.		———	1,238,500			
Miscellaneous		———	1,440,237			
Haydite		———	450,723	———	———	———
Total		———	$130,320,122	40.40	6,010	$ 23,861,721
Grand Total		———	$983,104,412	39.44	46,940	$219,366,494

(1)"Wage-Earners" for any mineral industry represents the employees of companies whose chief product is tha t 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		1956	1957	1958	1959	1960
Metallics						
Bismuth	lb.	6,980	14,214	18,581	31,457	37,835
	$	10,586	21,372	26,779	37,748	45,402
Calcium	lb.	394,900	221,225	25,227	67,429	134,801
	$	515,305	282,378	31,256	76,409	159,241
Cobalt	lb.	3,392,543	3,750,596	2,436,064	2,835,684	3,258,401
	$	8,781,626	7,541,258	4,866,767	5,414,246	6,312,921
Copper	lb.	312,541,701	343,406,269	284,069,476	376,544,371	412,544,528
	$	128,552,450	98,488,877	71,267,895	110,547,037	123,750,235
Gold	oz.	2,513,912	2,578,206	2,716,514	2,683,449	2,732,673
	$	86,489,962	86,621,067	92,192,231	90,083,383	92,774,248
Iron Ore	tons	5,558,203	4,867,105	3,644,952	6,018,089	5,325,197
	$	44,177,246	41,317,629	36,851,421	50,830,404	48,399,442
Lead	lb.	3,010,163	1,012,565	2,513,224	3,222,447	1,661,896
	$	466,876	141,354	285,502	341,902	177,490
Magnesium	lb.	14,639,734	15,184,373	9,087,362	8,144,940	14,577,138
	$	4,543,202	4,767,043	2,747,755	2,202,392	4,313,987
Nickel	lb.	335,152,371	354,792,843	254,286,784	347,929,183	403,300,283
	$	208,099,454	243,518,138	177,168,918	240,053,265	277,924,234
Platinum metals	oz.	314,818	416,147	300,458	328,091	483,585
	$	22,407,090	25,731,333	14,321,443	16,932,178	28,871,955
Pyrrhotite	tons	193,737	264,141	279,422	———	———
	$	759,449	685,335	655,569	632,140	762,661
Selenium	lb.	109,156	86,459	90,295	101,400	144,500
	$	1,473,606	951,049	677,213	709,800	1,011,500

Silver	oz.	6,625,447	6,910,130	9,815,257	10,540,856	11,220,823
	$	5,940,586	6,034,598	8,529,142	9,252,763	9,976,434
Tellurium	lb.	6,305	6,915	6,692	6,900	7,450
	$	11,034	12,101	11,376	14,835	26,075
Thorium	lb.	———	———	———	47,447	(1)
	$	———	———	———	105,676	(1)
Uranium (U_3O_8)	lb.	906,614	7,970,598	19,970,136	25,492,171	19,793,727
	$	9,361,867	82,940,763	210,149,700	268,529,993	211,983,533
Zinc	lb.	2,454,297	22,591,677	92,478,339	89,963,215	90,459,368
	$	364,218	2,731,334	10,061,643	11,011,498	12,076,326
Total Value	$	521,954,557	601,785,629	629,844,610	806,775,669	818,565,684
NON-METALLICS						
Arsenic trioxide	lb.	1,790,381	3,697,317	2,323,320	1,578,307	1,724,326
	$	77,612	137,112	94,542	63,786	70,400
Asbestos	tons	26,748	20,947	21,650	24,350	23,284
	$	3,929,782	3,529,570	3,849,370	4,327,628	4,128,920
Fluorspar	tons	270	2,430	1,256	———	———
	$	12,521	94,239	57,834	100,594	100,811
Garnet	tons	———	———	———	———	32
	$	———	———	———	———	4,480
Gypsum	tons	366,956	379,621	425,733	412,100	355,603
	$	840,829	853,199	1,059,590	1,017,340	871,408
Mica, amber	lb.	46,527	74,429	17,590	35,433	345,777
	$	635	2,332	736	531	5,745
Mica, white	lb.	8	16,487	6,961	325	———
	$	10	3,941	1,370	428	———
Mineral water	gals.	2,000	2,500	2,433	3,025	2,626
	$	1,700	2,012	1,946	1,936	1,890

(1)Not available.

COMPARATIVE OUTPUT AND VALUE OF MINERAL PRODUCTION—*Continued*

Product		1956	1957	1958	1959	1960
		NON-METALLICS—*Continued*				
Natural gas	M cu. ft.	12,811,618	14,400,913	16,147,986	16,839,236	16,987,056
	$	14,220,898	15,985,013	17,760,000	16,335,742	6,573,990
Nepheline syenite	tons	180,006	200,016	201,306	228,722	240,636
	$	2,574,140	2,754,060	2,613,446	2,930,932	2,891,095
Peat moss	tons	3,267	4,720	6,123	10,925	13,566
	$	97,091	220,232	216,055	295,390	338,614
Petroleum, crude	bbls.	593,370	623,666	778,341	1,001,580	1,005,030
	$	1,958,121	2,160,000	2,623,000	3,194,000	3,150,065
Quartz and quartzite	tons	1,571,819	1,591,091	922,599	1,600,352	1,659,410
	$	1,413,191	1,428,400	666,275	1,363,541	998,281
Silica brick	M	4,243	2,902	1,740	1,123	———
	$	384,648	291,412	187,061	114,684	———
Salt	tons	1,347,729	1,538,805	2,126,483	3,036,230	3,007,599
	$	7,932,294	9,478,587	10,204,472	13,228,977	13,994,545
Sulphur[1]	tons	53,481	54,264	———	———	———
	$	534,810	542,846	622,619	1,041,857	985,717
Talc and soapstone	tons	12,371	11,236	8,725	8,796	7,189
	$	167,851	160,015	125,511	125,903	102,645
Total Value	$	34,146,133	37,642,970	40,083,827	44,143,269	34,218,606
		STRUCTURAL MATERIALS				
Portland cement	tons	1,450,437	2,211,887	2,400,158	2,386,334	2,007,044
	$	21,455,019	33,505,994	35,195,552	31,731,767	30,699,800

Lime, hydrated, and quicklime	tons	673,357	766,143	1,009,916	1,130,055	990,088
	$	8,258,857	9,416,868	12,644,925	14,006,532	12,278,630
Sand and gravel	tons	61,436,363	66,129,158	67,469,064	73,981,703	77,660,833
	$	34,379,015	36,699,895	40,055,031	39,695,602	43,929,708
Sand-lime brick	$	748,533	441,086	———	———	———
Stone	tons	15,734,664	17,390,438	15,756,560	17,288,796	17,938,583
	$	20,820,727	22,195,815	20,670,480	22,053,425	23,220,659
Total Value	$	85,662,151	102,259,658	108,565,988	107,487,326	110,128,797
CLAY PRODUCTS						
Face brick	M	226,241	212,764	254,453	249,554	205,361
	$	12,396,750	11,761,223	14,608,555	14,441,307	11,734,214
Common brick	M	15,132	19,432	17,978	21,420	33,138
	$	434,764	474,546	591,662	547,260	1,080,471
Fancy and ornamental brick, special glazes	M	627	255	450	291	590
	$	71,175	29,428	52,820	34,092	81,459
Sewer brick	M	815	1,109	1,091	1,205	1,061
	$	38,779	44,563	47,923	48,185	42,496
Drain tile	M	42,761	41,013	49,163	44,483	51,637
	$	2,441,571	2,407,912	2,909,168	2,595,721	2,954,594
Tile, structural, roof, etc.	$	1,295,145	1,100,457	990,159	1,138,045	1,168,631
Sewer pipe, copings, flue linings, etc.	$	1,383,344	1,680,140	2,624,679	2,317,028	1,238,500
Pottery and other products	$	1,111,237	854,682	961,325	1,053,257	1,440,237
Haydite and clay	$	571	348	———	———	450,723
Total Value	$	19,173,336	18,353,299	22,786,291	22,174,895	20,191,325
GRAND TOTAL	$	660,936,177	760,041,556	801,280,716	980,581,159	983,104,412

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

TOTAL MINERAL PRODUCTION

Year	Metallics	Non-Metallics	Structural Materials	Clay Products	Total
To 31 Dec. 1955	$ 6,908,495,410	$525,053,084	$ 875,669,695	$277,667,295	$ 8,586,885,484
1956	521,954,557	34,146,133	85,662,151	19,173,336	660,936,177
1957	601,785,629	37,642,970	102,259,658	18,353,299	760,041,556
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
To 31 Dec. 1960	$10,287,421,559	$715,287,889	$1,389,773,615	$380,346,441	$12,772,829,504

Metal Production

During the recorded history of the mining industry in Ontario, metals have accounted for 80.54 percent of the accumulated mineral production value.

METAL PRODUCTION TO 31 DECEMBER 1960

Metal or Product	To 31 December 1959	1960	To 31 December 1960
Barium	$ 9,266	——	$ 9,266
Bismuth	348,276	45,402	393,678
Calcium	11,277,471	159,241	11,436,712
Cerium, rare earths	988	——	988
Chromite	55,090	——	55,090
Cobalt	88,413,740	6,312,921	94,726,661
Copper	1,543,202,116	123,750,235	1,666,952,351
Gold	2,782,542,929	92,774,248	2,875,317,177
Iron ore	363,611,084	48,399,442	412,010,526
Lead	7,520,553	177,490	7,698,043
Magnesium	37,977,564	4,313,987	42,291,551
Molybdenum	224,110	——	224,110
Nickel	3,158,944,472	277,924,234	3,436,868,706
Pig iron, from domestic ore	98,257,508	——	98,257,508
Platinum metals	417,710,310	28,871,955	446,582,265
Pyrrhotite	2,732,493	762,661	3,495,154
Selenium	9,524,894	1,011,500	10,536,394
Silver	347,879,365	9,976,434	357,855,799
Tellurium	332,816	26,075	358,891
Thorium	105,676	(1)	105,676
Tungsten	808,338	——	808,338
Uranium (U_3O_8)	571,469,377	211,983,533	783,452,910
Zinc, in ore and concentrates	25,907,439	12,076,326	37,983,765
Total	$9,468,855,875	$818,565,684	$10,287,421,559

(1)Not available.

Dividends

In 1960 dividends were paid by 17 gold mining companies, 2 silver-cobalt mining companies, 3 base metal mining companies, and 2 uranium mining companies.

DIVIDENDS PAID BY METAL-MINING COMPANIES TO 31 DECEMBER 1960

Industry	To 31 December 1959	1960	To 31 December 1960
Gold	$ 709,712,394	15,921,685	725,634,079
Nickel-copper	1,072,883,096	50,158,396	1,123,041,492
Silver-cobalt	107,182,775	213,687	107,396,462
Uranium	19,730,294	6,201,131	25,931,425
Total	$1,909,508,559	$72,494,899	$1,982,003,458

Metal Prices and Exchange

METAL PRICES AND EXCHANGE, 1959 AND 1960

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 Fine Ounce
			New York Market, U.S. Funds	Montreal, Canadian Funds		
1959:						
January	0.9669	2.7140	90.206	87.33	27.927	33.840
February	0.9749	2.7392	90.444	88.65	28.726	34.121
March	0.9698	2.7278	91.351	88.85	30.271	33.933
April	0.9635	2.7140	91.375	88.38	29.397	33.726
May	0.9629	2.7103	91.375	88.38	28.814	33.700
June	0.9588	2.6971	91.375	87.97	28.108	33.557
July	0.9574	2.6921	91.375	87.73	26.732	33.508
August	0.9544	2.6818	91.399	87.57	28.270	33.408
September	0.9516	2.6682	91.399	87.41	28.015	33.306
October	0.9477	2.6597	91.375	86.90	29.150	33.167
November	0.9503	2.6635	91.375	87.06	30.481	33.259
December	0.9512	2.6621	91.375	87.18	30.801	33.287
Average (12 months)	0.9590[1]	2.6939[1]	91.202	87.78	28.891	33,568
1960:						
January	0.9531	2.6686	91.375	87.44	31.555	33.358
February	0.9517	2.6681	91.375	87.28	31.994	33.308
March	0.9509	2.6682	91.375	87.18	30.745	33.284
April	0.9629	2.7054	91.375	88.31	31.684	33.701
May	0.9781	2.7446	91.375	89.53	30.302	34.241
June	0.9823	2.7533	91.375	90.18	30.290	34.388
July	0.9783	2.7479	91.375	89.75	31.010	34.243
August	0.9697	2.7255	91.375	88.91	29.925	33.945
September	0.9725	2.7355	91.375	89.07	28.611	34.029
October	0.9785	2.7514	91.375	89.82	27.111	34.241
November	0.9767	2.7482	91.375	89.56	27.470	34.190
December	0.9824	2.7583	91.375	89.90	28.036	34.432
Average (12 months)	0.9697[1]	2.7228[1]	91.375	88.91	29.894	33.946

[1]Computed from daily quotations.

PROSPECTING

The number of claims recorded in 1960 reflected a decline in prospecting activity when compared with 1959. Most mining divisions show fewer claims recorded in 1960. The greatest number were recorded in the Port Arthur mining division, immediately followed by those recorded in the Timiskaming, Sudbury, Patricia, Montreal River, Larder Lake, and Porcupine mining divisions. Licences issued and renewed totalled 5,755 in 1960, and 6,572 in 1959.

MINERS' LICENCES AND MINING CLAIMS, 1960

Mining Division	Miners' Licences		Mining Claims	
	Issued	Renewed	Recorded	Cancelled
Eastern Ontario	——	——	507	1,629
Fort Frances	37	72	402	619
Kenora	87	103	1,162	1,368
Kowkash[1]	——	——	774	1,975
Larder Lake	122	245	1,430	3,667
Montreal River	64	83	1,670	1,986
Parry Sound	——	——	186	196
Patricia	101	121	1,912	2,560
Porcupine	102	210	1,321	2,296
Port Arthur	361	443	3,095	3,833
Red Lake	52	112	1,227	3,081
Sault Ste. Marie	123	175	943	2,004
Sudbury	205	329	1,921	4,409
Timiskaming	138	194	1,924	1,094
At Toronto	501	1,775	——	——
Total	1,893	3,862	18,474	30,717

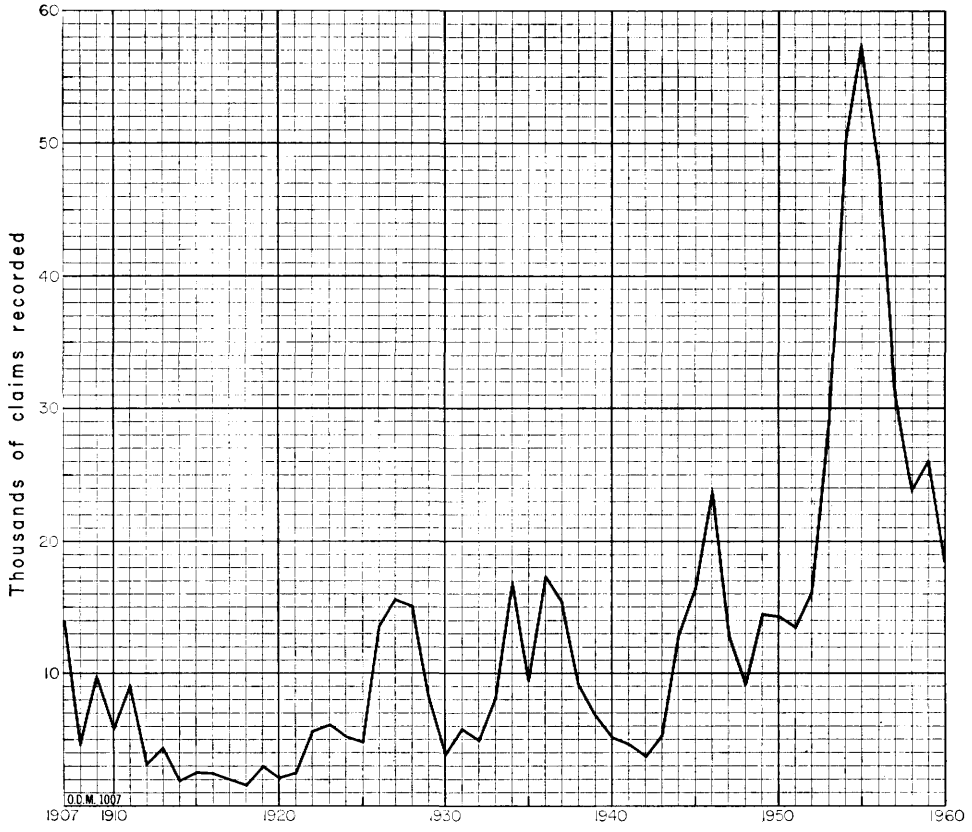
[1]Handled by the office of the Patricia Mining Division since 1 April, 1956.

MINING CLAIMS RECORDED IN THE ONTARIO MINING DIVISIONS

Mining Division	1954	1955	1956	1957	1958	1959	1960
Eastern Ontario	6,218	4,802	4,111	2,003	987	993	507
Fort Frances	725	2,063	1,103	433	801	422	402
Kenora	2,400	4,504	2,731	1,247	1,090	1,146	1,162
Kowkash[1]	——	——	——	3,549	896	1,368	774
Larder Lake	1,139	1,091	2,112	1,630	2,276	3,540	1,430
Montreal River	631	799	2,556	1,458	1,462	1,579	1,670
Parry Sound	564	384	423	291	39	182	186
Patricia	862	955	3,150	3,074	2,002	2,628	1,912
Porcupine	813	1,793	1,536	2,456	1,451	2,247	1,321
Port Arthur	21,055	14,552	8,532	4,351	4,027	3,479	3,095
Red Lake	1,299	1,875	2,657	1,078	2,657	2,554	1,227
Sault Ste. Marie	5,397	12,273	5,313	2,842	1,385	1,112	943
Sudbury	7,895	9,984	8,768	4,959	3,063	3,481	1,921
Timiskaming	1,178	2,292	5,005	1,576	1,844	1,300	1,924
Total	50,176	57,367	47,997	30,947	23,980	26,031	18,474

[1]Handled by the office of the Patricia Mining Division since 1 April 1956.

Mining Claims Recorded, 1907–1960

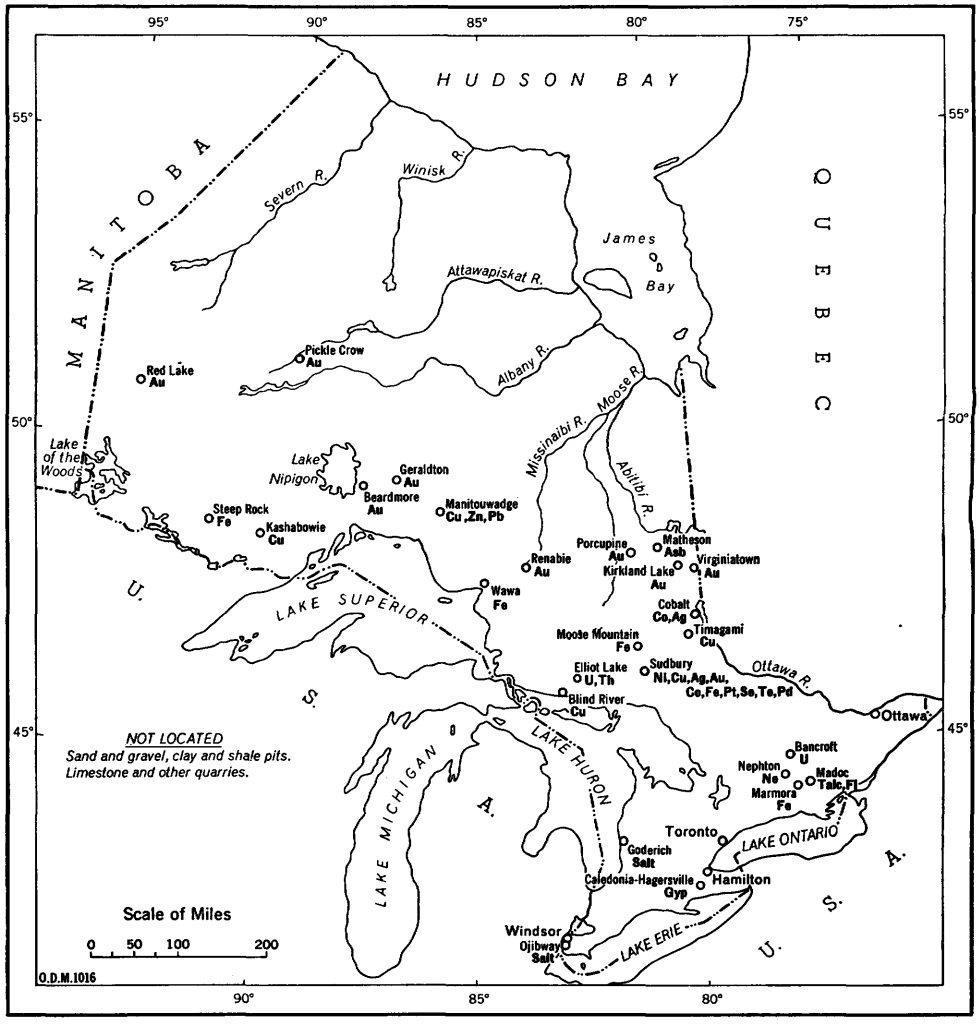


Mining Claims Cancelled in the Ontario Mining Divisions

Mining Division	1954	1955	1956	1957	1958	1959	1960
Eastern Ontario	1,610	3,179	5,075	4,974	3,270	1,701	1,629
Fort Frances	662	665	1,651	1,177	833	630	619
Kenora	1,003	812	3,249	3,595	2,433	1,697	1,368
Kowkash[1]	—	—	—	3,288	1,526	1,228	1,975
Larder Lake	1,395	2,238	1,450	2,004	2,201	1,604	3,667
Montreal River	945	795	792	2,196	1,911	1,858	1,986
Parry Sound	870	570	528	468	640	122	196
Patricia	130	929	1,198	1,064	1,725	1,273	2,560
Porcupine	968	757	958	2,440	2,147	1,803	2,296
Port Arthur	3,869	13,905	12,355	8,362	5,791	4,265	3,833
Red Lake	1,254	1,890	1,570	1,569	1,345	1,843	3,081
Sault Ste. Marie	1,921	6,216	9,436	9,362	4,570	2,203	2,004
Sudbury	5,498	8,656	6,326	9,821	8,160	4,036	4,409
Timiskaming	1,652	966	1,352	4,012	2,996	2,132	1,094
Total	21,777	41,578	45,940	54,332	39,548	26,395	30,717

[1]Handled by the office of the Patricia Mining Division since 1 April, 1956.

Principal Mining Areas of the Province of Ontario



Key to Symbols

Ag	— Silver	Fl	— Fluorspar	Pt	— Platinum
Asb	— Asbestos	Gyp	— Gypsum	Se	— Selenium
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

STATISTICS AND MINING OPERATIONS

Metallics

BISMUTH

Production of this metal increased 20.27 percent in quantity and value over the 1959 production. The 45,402 pounds produced were recovered in the refining of ores and concentrates from the silver-cobalt mines.

CALCIUM—*see* MAGNESIUM AND CALCIUM

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

COPPER—*see* NICKEL AND COPPER

GOLD

In 1960, 31 gold mines reported milling 9,336,756 tons of ore, from which was recovered 2,666,533 ounces of gold valued at $90,528,795, and 442,629 ounces of silver valued at $393,541. The average recovery per ton of ore milled was $9.74. The nickel-copper mines recovered in their operations 56,665 ounces of gold valued at $1,923,777, and the base metal mines recovered 9,475 ounces valued at $321,676. The total gold production for the province was, therefore, 2,732,673 ounces valued at $92,774,248. This was an increase of 1.84 percent in quantity and 2.99 percent in value over the 1959 production.

The gold mines paid $6,424,799 to 1,160 salaried personnel and $39,909,792 to 10,669 wage-earners. They used fuel and electricity worth $4,429,912, and process supplies worth $16,449,673.

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

Year	Porcupine	Kirkland Lake, Larder Lake, and Sudbury	Northwestern Ontario	Total
1912–55	$316,030,502	$273,752,580	$50,660,569	$640,443,651
1956	6,082,909	5,672,498	3,487,141	15,242,548
1957	8,177,576	5,255,623	3,011,421	16,444,620
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
Total	$358,827,376	$299,795,263	$67,011,440	$725,634,079

GOLD PRODUCTION, 1960

Areas and Mines	Rated Daily Mill Capacity	Daily Operating Average	Ore Milled	Bullion Recovered				Total Value of Bullion
				Gold Content		Silver Content		
				Quantity	Value	Quantity	Value	
	tons	tons	tons	ounces		ounces		
PORCUPINE								
Aunor	750	724	264,867	83,697	$ 2,841,513	6,207	$ 5,519	$ 2,847,032
Broulan Reef	700	500	132,215	23,066	783,091	1,849	1,644	784,735
Coniaurum	500	388	126,125	25,808	876,182	5,582	4,963	881,145
Delnite	520	504	184,491	46,437	1,576,536	3,288	2,923	1,579,459
Dome	1,975	1,985	714,600	176,338	5,986,675	38,412	34,152	6,020,827
Hallnor	400	330	120,614	41,260	1,400,777	3,131	2,784	1,403,561
Hollinger	3,900	3,878	1,051,222	284,118	9,645,806	49,946	44,407	9,690,213
Hugh-Pam	milled at Broulan Reef		50,464	8,977	304,769	———	———	304,769
McIntyre	2,400	2,274	775,348	217,650	7,389,217	34,061	30,283	7,419,500
Pamour	1,750	1,770	646,118	62,682	2,128,054	8,361	7,434	2,135,488
Paymaster	750	544	199,119	41,052	1,393,715	9,585	8,522	1,402,237
Preston	800	620	227,100	53,885	1,829,396	6,293	5,595	1,834,991
Ross	450	406	140,154	19,443	660,090	76,304	67,842	727,932
Total	14,895	13,923	4,632,437	1,084,413	$36,815,821	243,019	$216,068	$37,031,889
KIRKLAND LAKE								
Kirkland Minerals	400	191	48,066	18,802	638,328	1,874	1,666	639,994
Lake Shore	1,200	930	175,501	65,760	2,232,552	23,195	20,622	2,253,174
Macassa	500	409	149,862	69,778	2,368,963	10,373	9,223	2,378,186
Sylvanite	600	363	132,951	32,437	1,101,236	8,038	7,147	1,108,383
Teck-Hughes	650	522	190,900	29,523	1,002,306	3,068	2,728	1,005,034
Upper Canada	550	568	207,915	53,859	1,828,513	30,676	27,274	1,855,787
Wright-Hargreaves	milled at Lake Shore		164,985	62,635	2,126,458	17,723	15,757	2,142,215
Total	3,900	2,983	1,070,180	332,794	$11,298,356	94,947	$ 84,417	$11,382,773
LARDER LAKE								
Kerr Addison	4,000	4,556	1,667,638	592,244	20,106,684	33,371	29,670	20,136,354
SUDBURY								
Renabie	550	490	179,520	38,911	1,321,028	11,061	9,834	1,330,862

KENORA (PATRICIA PORTION)								
Campbell Red Lake	700	705	257,898	162,658	5,522,239	11,535	10,256	5,532,495
Cochenour Willans	230	246	90,010	73,804	2,505,646	2,854	2,537	2,508,183
Dickenson	470	469	171,840	91,540	3,107,783	8,838	7,858	3,115,641
Madsen Red Lake	800	837	306,377	119,076	4,042,630	18,575	16,515	4,059,145
McKenzie Red Lake	235	227	83,194	17,830	605,328	4,370	3,885	609,213
Pickle Crow	400	329	120,345	39,663	1,346,559	5,067	4,505	1,351,064
H. G. Young	425	288	35,199	6,740	228,823	755	671	229,494
Total	3,260	3,101	1,064,863	511,311	$17,359,008	51,994	$ 46,227	$17,405,235
THUNDER BAY								
Leitch	120	89	32,520	37,848	1,284,940	1,585	1,409	1,286,349
MacLeod-Cockshutt	1,900	1,884	689,598	68,462	2,324,285	6,574	5,845	2,330,130
Total	2,020	1,973	722,118	106,310	$ 3,609,225	8,159	$ 7,254	$ 3,616,479
SUNDRIES								
Clean-up of abandoned operations	—	—	—	550	18,673	78	71	18,744
Total for Gold Mines, 1960	28,625	27,026	9,336,756	2,666,533	$90,528,795	442,629	$ 393,541	$90,922,336
Nickel-copper refining	—	—	—	56,665	1,923,777	—	—	—
Base metal mines	—	—	—	9,475	321,676	—	—	—
Total Gold Production, 1960	—	—	—	2,732,673	$92,774,248	—	—	—

GOLD PRODUCTION, 1959

Porcupine	—	—	4,521,549	1,089,692	36,580,960	212,947	186,925	36,767,885
Kirkland Lake	—	—	1,109,895	352,247	11,824,932	95,086	83,467	11,908,399
Larder Lake	—	—	1,662,534	567,304	19,044,395	31,864	27,970	19,072,365
Sudbury	—	—	195,898	36,350	1,220,269	10,579	9,286	1,229,555
Kenora (Patricia Portion)	—	—	1,005,129	484,538	16,265,941	49,685	43,613	16,309,554
Thunder Bay	—	—	730,184	103,038	3,458,986	7,930	6,961	3,465,947
Sundries	—	—	—	343	11,515	23	20	11,535
Total for Gold Mines, 1959	—	—	9,225,189	2,633,512	$88,406,998	408,114	$358,242	$ 88,765,240
Nickel-copper refining	—	—	—	42,509	1,427,027	—	—	—
Base metal mines	—	—	—	7,428	249,358	—	—	—
Total Gold Production, 1959	—	—	—	2,683,449	$90,083,383	—	—	—

Abino Gold Mines Limited

Abino Gold Mines Limited was incorporated in September 1939, with an authorized capitalization of 5,000,000 shares of $1 par value of which 3,317,019 shares have been issued. The officers and directors were: A. W. White, president and director; G. A. MacMillan, vice-president and director; H. R. Heard, secretary-treasurer and director; W. F. Stafford and Albert Kay, directors. The head office is at 25 Adelaide Street West, Toronto. The mine address is Cochenour.

The company's holdings consist of 19 claims on the mutual corners of Balmer, Bateman, Dome, and McDonough townships, District of Kenora (Patricia Portion). The property is about 3 miles north of the Cochenour Willans mine. An all-weather road and a hydro line had been constructed to the property in 1959.

Operations at the property continued from January to 15 September 1960, when the mine was closed, and further surface diamond-drilling was planned.

The No. 1, vertical, three-compartment shaft, located in Balmer township, was sunk a further 488 feet in 1960 to a total depth of 538 feet below the collar. The 1st, 2nd, and 3rd levels were established at depths of 198, 353, and 498 feet, respectively, below the collar.

Development footage in 1960 consisted of 669 feet of crosscutting on the 1st level; 962 feet of crosscutting on the 2nd level; and 1,071 feet of crosscutting and 306 feet of raising on the 3rd level. This was also the accumulated development footage total to 31 December 1960. Some 89 diamond-drill holes, totalling 19,584 feet, were completed in 1960 from underground.

New construction consisted of a core house (12 x 48 ft., spruce-frame construction). Added equipment included 12 mine dump cars (30-cu. ft.-capacity, 24-in.-gauge); 2 locomotives plus accessories (Atlas); and 2 mucking machines (Eimco B12).

The average number of employees was 24: 17 underground supplied by the contractor, and 7 on surface supplied by the mine. W. F. Atkins was mine manager during the period of operation.

Arjon Gold Mines Limited

Arjon Gold Mines Limited pumped the shaft of Matona Golds Limited. The shaft is located in Tyrrell township, west of Gowganda. The 125-foot level was sampled, and then the property was closed down.

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; J. Y. Murdoch, N. C. Urquhart, and K. C. Gray, directors; C. H. Windeler, secretary; R. G. Rudolf, treasurer. The head office is at the Bank of Nova Scotia Building, Toronto. The mine address is Box 2001, Timmins.

The company owns nine claims and holds a 99-year lease on two others, in Deloro township, Porcupine area, District of Cochrane.

Mining and milling continued throughout 1960.

SHAFTS, AUNOR MINE

	Claim No.	Inclination	Number of Compartments	Depth Below Collar
				feet
No. 1	H.S.850	Vertical	3	3,082
No. 2 (service winze between 2,125- and 2,900-ft. levels)	T.R.S.828	62°	2	902

Development work in 1960 consisted of the following: drifting, 2,359 feet; crosscutting, 147 feet; raising, 756 feet. Total development footage to 31 December 1960 was as follows: 74,601 feet of drifts; 15,740 feet of crosscuts; 33,536 feet of raises. Diamond-drilling in 1960 consisted of 340 holes, totalling 23,327 feet, from underground.

The following is taken from the annual report for the year ending 31 December 1960:

Mining

Mining was carried on between the 1,500-foot and 2,900-foot levels. The mining areas above the 2,125-foot level are nearing exhaustion and supplied only 25 percent of the total tonnage mined in 1960. This source of ore will be finished in 1962, when mining will be concentrated in the areas below the 2,125-foot level.

Total ore mined during the year amounted to 265,260 tons with an average grade of 0.33 ounces gold per ton, as compared with 266,550 tons grading 0.34 ounces gold per ton in 1959.

Development

Development work between the 2,125-foot and the 2,900-foot levels was directed towards further exploration of the ore zone and its preparation for mining.

Detailed examination on the 3,500-foot level has indicated six ore shoots with an average width of 9.7 feet and aggregate length of 1,550 feet. The average grade is 0.363 ounces gold per ton. The continuity of these ore shoots immediately above and below the level has not been explored.

On the 3,250-foot level, the ore zone has been drifted on from the Aunor-Delnite boundary to a point 1,078 feet east. Based on preliminary diamond-drilling and sampling, ore conditions appear similar to those on the 3,500-foot level.

Preliminary examination of the drift driven from Delnite's 3,250-foot level indicated similar ore conditions to those obtained on the 3,500-foot level. At the year's end, Delnite had started to extend their 4,975-foot level into Aunor ground. Drifting on the 4,975-foot level has only begun, and no ore information is available.

Ore Reserves

At the year's end the proven ore reserves were 1,120,000 tons averaging 0.358 ounces gold per ton.

As compared with 265,000 tons milled, some 295,000 tons of new ore was proved, all in the block between the 2,125-foot and the 2,900-foot levels.

Mill

	1960	1959	Total
Milled ..... tons	264,867	265,558	3,754,588
Milled per calendar day ..... tons	723.7	727.6	490.5
Average gold content ..... oz. per ton	0.332	0.342	0.357
Average tailings loss ..... oz. per ton	0.016	0.017	0.011
Total recovery ..... percent	95.26	94.94	96.95
Total production ..... oz. gold	83,697	86,183	1,298,026
Value of total production	$2,849,796	$2,898,334	$46,483,388
Recovery per ton	$10.76	$10.91	$12.38

Considerable work was involved in repairing a major break-out in the main tailings disposal area. An alternative area was acquired and is being prepared for early use.

The average number of employees was 392: 284 underground, and 108 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: B. W. Lang, president and director; F. G. Lawson, vice-president and director; H. F. Brownbill, J. B. Streit, F. H. Snyder, and N. M. Davis, directors; W. H. Maedel, secretary-treasurer. The head office is at 80 Richmond Street West, Toronto. The mine address is Pamour.

The company owns the Broulan Reef mine and the old Bonetal and Bonwhit mines, 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. (*see* page 33.) 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 1960. All operations were conducted through the Reef No. 1 shaft, on the northeast 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.

Development work in 1960 consisted of: drifting, 2,417 feet; crosscutting, 679 feet; raising, 1,795 feet. Total development footage to 31 December 1960 was as follows: 35,226 feet of drifts; 11,730 feet of crosscuts; 14,766 feet of raises. Diamond-drilling during the year consisted of 154 holes, totalling 30,668 feet, from underground.

The following is taken from the mine manager's report for the year ending 31 December 1960:

Ore Reserves

Proven ore reserves at the Boulan Reef mine are calculated to be 110,000 tons, having an average uncut grade of 0.41 ounces of gold per ton, or a grade cut to one ounce of 0.24 ounces per ton.

Milling

During the year the mill treated a total of 182,681 tons of ore from the Broulan Reef and Hugh-Pam mines for a daily average of 500 tons. Recovery averaged 96.6 percent.

General

Some 13,056 tons of waste rock was broken and hoisted from exploration and development work.

Operating costs for the 132,216 tons mined and milled during the year from Broulan Reef mine, including head office, administrative, and general expenses, amounted to $7.89 per ton.

The average number of employees was 176; 100 underground, and 76 on surface. R. F. Dewar 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 50 King Street West, Toronto. 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 1960.

The vertical, four-compartment No. 1 shaft, located in claim K.R.L.20071, was sunk a further 421 feet to a depth of 3,281 feet below the collar. New levels established were Nos. 20, 21, and 22 at 2,950, 3,100, and 3,250 feet, respectively, below the collar.

Development work in 1960 was as follows: drifting, 11,846 feet; crosscutting, 833 feet, raising, 2,120 feet. Total development to 31 December 1960, was as follows: 109,101 feet of drifts; 20,316 feet of crosscuts; 28,645 feet of raises. Diamond-drilling in 1960 included 7 holes, totalling 9,394 feet, from surface, and 228 holes, totalling 38,297 feet, from underground.

New equipment added included a hoist-control complete with motor (450-hp., English Electric) to increase the present hoist speed from 1,000 to 1,500 feet per minute; 2 string filters (drum-type, 11.5 x 16 feet, Eimco Corp.); 1 loading pocket, 102 feet below the 21st level (100–120 cu. ft. capacity, Wabi Iron Works); and 2 loaders (7 cu. ft.-bucket capacity, Atlas Copco, LM-56).

The following is taken from the general manager's report for the year ending 31 December 1960:

Mining

Broken ore totalling 260,500 tons remains in the stopes, an increase of 29,400 tons from the previous year.

In all, 218,326 tons of a grade of 14.22 pennyweight were drawn from the stopes and sent to the mill.

All stoping operations were above the 9th level, or 1,300-foot horizon, with the exception of minor stoping on two levels below the 9th level, which will form part of the ventilation system.

Ore Production

The mine produced 257,898 tons of ore during the year, averaging 13.51 pennyweight. The stopes produced 218,326 tons averaging 14.22 pennyweight, and development work produced 39,572 tons averaging 9.59 pennyweight.

Ore Reserves

The ore reserves are estimated at 1,128,100 tons, an increase of 31,500 tons over last year. The ore reserves include 260,500 tons of broken ore, a gain of 29,400 tons over last year.

A summary of the distribution of ore in place, broken ore, and total ore extracted from stopes to the end of 1960 is as follows:

SUMMARY OF ORE RESERVES AND EXTRACTION BY LEVELS

Levels	Ore in Place	Average Grade	Broken Ore	Total Ore Extracted from Stopes to End of 1960
	tons	dwt. per ton	tons	tons
Surface—1st	9,300	11.76	8,700	228,822
1st—2nd	20,400	11.91	7,500	272,904
2nd—3rd	33,000	10.68	——	251,221
3rd—4th	33,900	9.64	9,000	327,438
4th—5th	53,100	11.98	40,100	263,008
5th—6th	107,700	14.74	78,400	200,864
6th—7th	126,500	12.38	29,900	202,936
7th—8th	71,200	12.60	22,500	129,541
8th—9th	12,700	14.03	54,100	80,899
9th—10th	89,900	13.44	1,200	3,807
10th—11th	51,500	12.53	——	——
11th—12th	57,900	11.85	8,400	5,407
12th—13th	69,800	14.65	300	1,098
13th—14th	130,700	14.44	400	840
Total	867,600	13.08	260,500	1,968,785

Mill

The following are the results of milling operations:

Treated	tons	257,898
Average treated per day	tons	705
Average grade of ore treated	dwt. per ton	13.51
Recovery	dwt. per ton	12.61
Recovery per ton	percent	93.37

Costs

The expenditure on mining was $836,137 or $3.24 per ton milled.

The expenditure on development (excluding shaft-sinking, surface diamond-drilling, and work done by H. G. Young Mines Limited) was $540,168 or $2.09 per ton milled.

Operating costs (exluding the above-mentioned items) were $8.77 per ton milled.

General

Mill recovery for the year again showed a slight improvement. Operating experience has now justified the substantial expenditures incurred five years ago for improvements in roasting equipment.

Exploration at depth of parts of the property remote from known ore zones continued during the year. This work, together with the sinking program, adversely affected costs.

The average number of employees was 291: 146 underground, and 145 on surface. Joseph Chisholm was general manager.

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 1960.

SHAFTS, COCHENOUR WILLANS MINE

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

Development work in 1960 consisted of the following: drifting, 6,918 feet; crosscutting, 3,319 feet; raising, 4,880 feet. Development footage to 31 December 1960, was as follows: 80,925 feet of drifts; 57,213 feet of crosscuts; 49,213 feet of raises. Diamond-drilling in 1960 consisted of 495 holes, totalling 78,129 feet, from underground, and two holes, totalling 1,050 feet, from surface.

New construction in 1960 included a lime-storage building (20 x 41.8 feet) and a compressor building (32 x 53.8 feet), both Butler steel buildings.

Equipment added in 1960 included 1 pump (5 x 4 SRL, 6,900 rpm., Canadian Allis-Chalmers).

The following is taken from the manager's report for the year ending 31 December 1960:

Summary

The total value of production in 1960 exceeded $2,500,000 for the first time in company history.

The increase in production above the previous year was attained for several reasons:

1) Daily tonnage was increased by 15.8 tons per day, plus an extra day in 1960, when compared with 1959.
2) There was an increase in grade of 0.0093 ounces per ton.
3) An improvement in milling recovery of 0.64 percent.
4) A higher price for gold was received during 1960, of 75 cents per ounce.

Costs

The use of the scraper-loaded train, electric trolley, and polyethelene plastic ventilation duct for the long exploration drives has reduced costs appreciably. This single train is now being used by two separate crews per shift, or by four per day, making possible a total development advance in these particular 8- by 9-foot crosscuts of 40 feet per day, an average of 3½ feet per man per shift, which includes all permanent track laying, ditching, and installation of permanent water and air lines and ventilation duct.

Details of operating costs are set out in the following tables, and include the years 1959 and 1958 for comparison.

Operating Costs

	Total Cost	Cost per Ton Milled		
		1960	1959	1958
Development and exploration	$ 367,573.97	$ 4.084	$ 4.158	$ 3.263
Stope preparation	67,680.86	0.752	0.807	0.895
Mining	536,072.61	5.955	5.967	6.206
Milling	282,230.24	3.136	2.990	2.832
General mine expense	198,410.06	2.204	2.410	2.360
Head office expense	34,297.97	0.381	0.345	0.384
Marketing charges	17,410.40	0.194	0.177	0.234
Total Operating Costs	$1,503,676.11	$16.706	$16.854	$16.174
Milled ... tons	——	90,010	84,004	77,804

Milling and Metallurgy

Details of the milling operations are shown in the following summary for the year. There was a further improvement in the year's percentage extraction. Comparative figures for the three previous years are included.

	Year Ending 31 Dec. 1960	Year Ending 31 Dec. 1959	Year Ending 31 Dec. 1958	Year Ending 31 Dec. 1957
Milled ... tons	90,010	84,004	77,804	75,550
Operating time of total time ... percent	99.18	99.02	99.16	99.42
Average milled daily ... tons	245.9	230.1	213.2	207.0
Average gold assay of heads ... oz.	0.8627	0.8534	0.8726	0.8577
Average gold recovered per ton ... oz.	0.8198	0.8055	0.8097	0.8026
Average gold assay of tails:				
Flotation tails ... oz.	0.0171	0.0226	0.0388	0.0349
Calcine tails ... oz.	0.0258	0.0253	0.0241	0.0202
Recovery ... percent	95.03	94.39	92.79	93.58

The changes made in the milling circuit last year have continued to improve extraction, but a new problem has been presented in the form of a percentage of talc in some of the ore. This material, when present in the concentrate, reduces the amount of sulphur to a point where roasting ceases.

Mining

The mill feed was supplied from the mining of 70 stopes, which produced 81,220 tons of ore averaging 0.9005 ounces gold per ton, and 61 development places, which produced 8,790 tons averaging 0.514 ounces per ton, for a total of 90,010 tons averaging 0.8627 ounces per ton.

Due to the severe faulting in the blocks, an unknown factor precludes any positive attempt to estimate ore reserves. However, the indicated ore picture continues to broaden and is favourable.

The average number of employees was 194: 96 underground, and 98 on surface. J. E. J. Fahlgren, vice-president, was manager at the property.

Coniaurum Mines Limited

Coniaurum Mines Limited was incorporated in July 1929, with an authorized capitalization of 3,000,000 shares of no par value, of which 2,766,743 shares have been issued. The officers and directors are: H. S. McGowan, president and director; Thayer Lindsley, J. T. McWhirter, W. S. Morlock, T. H. Rea, A. G. Fulton, and G. T. N. Woodrooffe, directors; D. D. Anderson, secretary; J. T. McWhirter, treasurer. The head office is at 25 King Street West, Toronto. The mine address is Schumacher.

The main property consists of 19 claims, adjoining the McIntyre Porcupine mine, in Tisdale township, Porcupine area, District of Cochrane. It includes the former Goldale, Newray, Armstrong-Booth, and Strong Bow properties.

Mining and milling continued throughout 1960.

SHAFTS, CONIAURUM MINE

	Location	Number of Compartments	Total Depth from Surface
			feet
Bishop shaft	N. ½, lot 7, con. III, Tisdale tp.	3 to 2,000 ft. 4 below 2,000 ft.	3,666
Bishop subshaft (below 3,250-foot level)	———	4	5,641
Goldale shaft	SE. ¼ of N. ½, lot 8, con. III, Tisdale tp.	2 to 400 ft. 3 below 400 ft.	1,020
No. 1 winze (below 2,000-foot level)	———	2	2,533
No. 2 winze (below 3,000-foot level)	———	2 to 3,500 ft. 3 below 3,500 ft.	5,028
No. 3 winze (below 2,000-foot level)	———	2	2,755

Development work in 1960 included 2,452 feet of drifting, 590 feet of crosscutting, 2,151 feet of raising. Total development footage to 31 December 1960, was as follows: 116,059 feet of drifts; 126,886 feet of crosscuts; 117,794 feet of raises. Diamond-drilling in 1960 consisted of 97 holes, totalling 36,163 feet, from underground.

The average number of employees was 186: 123 underground, and 63 on surface. W. O. Lafontaine was mine 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; 3,254,410 shares have been issued. The officers and directors were: J. G. Boeckh, president; P. K. Hanley, vice-president; B. A. Argo,

secretary; A. K. Harvie, R. C. Stanley Jr., S. J. Bird, J. C. L. Allen, and J. C. Adamson, directors. The head office is at 199 Bay Street, Toronto. The mine address is Geraldton.

The main property consists of 20 claims west of the MacLeod-Cockshutt mine, in Errington township, District of Thunder Bay. The company also owns the former Hard Rock property, consisting of 17 claims in Errington township.

Operations at the main property continued throughout 1960. 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. In 1960 the 10th level was established 1,580 feet below the shaft collar.

Development work in 1960 consisted of 3,069 feet of drifting, 1,391 feet of crosscutting, and 1,187 feet of raising. Total development footage to 31 December 1960 was as follows: 12,045 feet of drifts; 6,485 feet of crosscuts; 2,838 feet of raises. Diamond-drilling in 1960 consisted of 338 holes, totalling 31,945 feet, from underground.

New construction included an ore-and-waste trestle (22 ft. high, 165 ft. long), from the headframe and a hydro power substation (13 x 24 ft., with concrete floors).

A total of 2,160 tons of ore was hoisted.

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 80 cents par value, of which 2,978,767 shares have been issued. The directors and officers were: W. V. Moot, president and managing director; L. R. Gulick, F. R. Burton, and A. F. Osborn, directors; K. C. Gray, vice-president in charge of operations; Whitworth Ferguson, vice-president; W. S. Walton, secretary-treasurer. The address of both the head office and mine office is Box 590, Timmins.

The property consists of 8 claims in Deloro township, Porcupine area, District of Cochrane, 3 miles southeast of Timmins.

Mining and milling continued throughout 1960.

SHAFTS, DELNITE MINE

	Claim No.	Inclination	Number of Compartments	Depth from Surface
				feet
No. 1 shaft[1]	T.R.S.825	Vertical	2	391
No. 2 shaft	T.R.S.825	Vertical	3	3,031
No. 3 internal shaft (below 2,875-foot level)	——	Vertical	4	5,382

[1]Not being used.

Development work in 1960 consisted of 2,560 feet of drifting, 386 feet of crosscutting, and 1,765 feet of raising. Total development footage to 31 December 1960 was as follows: 89,219 feet of drifts, 44,566 feet of crosscuts, and 53,243 feet of raises. Diamond-drilling in 1960 consisted of 145 holes, totalling 16,530 feet, from underground.

The following is taken from the mine manager's report for the year ending 31 December 1960:

Broken-ore Reserves

Broke-ore reserves are estimated at 12,816 tons, a decrease of 3,954 tons in the year.

Costs

Distribution	In Full	Per Ton Milled		Per Ounce of Gold Produced
		1960	1959	1960
OPERATING COSTS (before cost-aid):				
Development and exploration	$ 111,691	$0.61	$0.45	$ 2.41
Mining	1,079,384	5.85	6.10	23.24
Milling	312,409	1.70	1.58	6.73
General mine charges after deducting sundry revenue	145,242	0.79	0.84	3.13
Administrative expense (partly mine)	51,575	0.28	0.27	1.11
Bullion marketing expense, including mint handling and refining charges	12,281	0.06	0.06	0.26
Total of Operating Costs	$1,712,582	$9.29	$9.30	$36.88
OTHER COSTS:				
Depreciation	$ 16,650	$0.09	$0.08	$ 0.36
Shaft-sinking and development write-off	60,039	0.32	0.37	1.29
Provision for Ontario mining taxes	8,660	0.05	0.01	0.19
Outside exploration	4,188	0.02	0.07	0.09
Total Other Costs	$ 89,537	$0.48	$0.53	$ 1.93
Total All Costs	$1,802,119	$9.77	$9.83	$38.81

Mining

Stoping was done on fourteen levels, two of which were in the No. 2 shaft area.

General mine productivity remained the same as in 1959.

The grade of ore was up somewhat over that mined in 1959. This was due to an increasing amount of better grade ore from the bottom levels, towards the latter part of the year.

Wider widths and heavy ground conditions at depth continued to present problems and made mining more difficult and costly.

Milling

The mill operated continuously throughout the year, with an average daily rate of 504 tons, compared with 501 tons for the operating period in 1959.

As a result of test work conducted by the Bureau of Mines in Ottawa, three additional flotation cells were added to the concentrating circuit, and with the purchase of a pH meter, closer control of the alkalinity of the cyanide circuit was made possible. Even with these improvements in technique the percentage extraction dropped slightly as the percentage sulphide from the lower levels increased.

General

At the request of, and for the account of Aunor Gold Mines Limited, Delnite drove into Aunor ground 1,078 feet on the 3,250-foot level, 182 feet on the 3,500-foot level, and 86 feet on the 4,975-foot level.

The average number of employees was 252: 171 underground, and 81 on surface. G. A. Vary was mine manager.

Dickenson Mines Limited

Dickenson Red Lake Mines Limited was incorporated in November 1944, with an authorized capitalization of 3,500,000 shares of $1 par value. In June 1947, the capitalization was increased to 4,000,000 shares. In June 1949, the company was reorganized, and the name was changed to New Dickenson Mines Limited. The capitalization was reduced to 3,750,000 shares of $1 par value.

In October 1960, the name was changed to Dickenson Mines Limited on amalgamation of New Dickenson Mines Limited and Lake Cinch Mines Limited. The number of shares issued at the end of 1960 was 3,506,940. The directors and officers were: A. W. White, president, treasurer, and director; C. R. Diebold, vice-president and director; R. A. Jodrey, S. C. Smith, M. L. Urquhart, R. B. Law, and L. I. Ross, directors; D. F. Burt, secretary; L. W. McIlmurray, assistant secretary; H. R. Heard, assistant treasurer. The head office is at 25 Adelaide Street West, Toronto 1. The mine address is Balmertown.

The property comprises 31 claims in Balmer township, Red Lake area, District of Kenora (Patricia Portion).

Mining and milling continued throughout 1960.

SHAFTS, DICKENSON MINE

	Claim No.	Inclination	Number of Compartments	Total Depth from Surface
				feet
No. 1 shaft	K.R.L.19497	Vertical	3 to 8th level 4 to bottom	2,969
Detta shaft (inactive)	K.R.L.19502	Vertical	3	280

A total of 6,668 feet of drifting, 2,393 feet of crosscutting, and 3,788 feet of raising was completed in 1960. Total development footage to 31 December 1960 was as follows: 53,745 feet of drifts; 38,860 feet of crosscuts; 31,432 feet of raises. Diamond-drilling in 1960 consisted of 368 holes, totalling 59,474 feet, from underground.

New construction included an addition to the assay office (18 x 32 feet, frame construction), and an insulated passageway (12 x 48 feet, 8 feet high) between the dry and shaft-house for aluminium therapy.

New equipment installed was as follows:

MILL
2 cyclones (Krebs, Model D 15B).
2 flotation machines (Denver No. 182).

ASSAY OFFICE
1 assay furnace (Williams and Wilson, Globar).

UNDERGROUND
10 mine cars (48 cu. ft., Hudson, side-dump).
1 slusher (Pekrose Rotaire, size 1).
1 air hoist (single-drum, Joy, No. 111).
1 silicon rectifier (Electric Products, Model MSC 20-125).

The following is taken from the general manager's report for the year ending 31 December 1960:

Mining

Broken ore totalling 160,431 tons remained in the stopes, an increase of 8,983 tons from the previous year.

Of the 172,120 tons of ore hoisted, 27,087 tons were obtained from development, and 145,033 tons were obtained from stoping and stope preparation.

Stoping operations were confined mainly to the North C, South C, and D zones on the upper fifteen levels. Of the total ore hoisted the percentages from the zones were: north C, 20.6 percent; south C, 48.1 percent; D, 20.7 percent; miscellaneous (E, F, and G), 10.6 percent.

The "shrinkage stope" method of mining was continued. Tons broken per rock-drill-shift in stopes and back stopes was 36.2 compared to 42.0 in 1959. The average stoping width was 5.3 compared to 6.0 feet the previous year, reflecting a move to more selective mining and to narrower veins being mined.

Analysis of Operating Costs

Distribution	1960			1959
	In Full	Per Ton Milled	Per Ounce	Per Ounce
Shaft deepening	$ 12,450	$ 0.07	$ 0.14	$0.77
Exploration and development	459,981	2.67	5.02	4.49
Mining	720,683	4.19	7.87	7.88
Milling	443,339	2.58	4.84	4.77
Mine general expense	289,013	1.68	3.16	3.34
Head office expense	100,572	0.58	1.10	0.72
Marketing charges	27,828	0.16	0.30	0.34
Total	$2,053,866	$11.93	$22.43	$22.31

Ore Reserves

At 31 December 1960 positive ore reserves, broken and in place, were calculated to be 497,489 tons having an average grade of 0.552 ounces of gold per ton. This compares with 511,257 tons grading 0.558 ounces per ton at 31 December 1959.

Milling

A summary of mill operations, with the previous year given as comparison, follows:

	1960	1959
Treated ..... tons	171,840	171,227
Operating time ..... percent	98.43	98.97
Treated per day ..... tons	469.5	469.1
Average content of millheads ..... oz. of gold per ton	0.584	0.561
Assay of mill tails ..... oz. of gold per ton	0.051	0.059
Recovery ..... oz. of gold per ton	0.533	0.502
Recovery ..... percent	91.2	89.4

General

Operating costs at the mine are up $0.53 per ton over 1959. Of this increase, $0.22 is reflected in the increase of 8,983 tons of broken-ore reserve, and $0.16 represents the cost of operating the 8-foot by 12-foot, Allis-Chalmers, re-grind ball mill, which has increased the total mill recovery from 89.4 percent in 1959 to 91.2 percent in 1960.

This year Dickenson was the winner of: the Ryan Trophy for the lowest accident frequency of all metalliferous mines in Ontario; the Red Lake District Mine Rescue Competition; the second place in the Provincial Mine Rescue Competition.

The average number of employees was 261: 139 underground, and 122 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, all of which have been issued; 53,332 shares are held in trust for the company. 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 are at South Porcupine. The secretary's office is at 36 Toronto Street, Toronto.

The company owns 62 claims, and parts of the beds of Porcupine and Simpson lakes, in Tisdale, Whitney, and Shaw townships, Porcupine area, District of Cochrane.

Mining and milling continued throughout 1960.

SHAFTS, DOME MINE

	Location	Inclination	Number of Compartments	Total Depth from Surface
				feet
No. 1 shaft[1]	P.12866	Vertical	3	105
No. 2 shaft[1]	P.12864	Vertical	3	805
No. 3 or main shaft	P.12864	Vertical	4 to 10th level 6 below 10th level	2,456
No. 4 internal shaft (below 13th level)[1]	——	Vertical	Timber removed	2,052
No. 5 internal shaft (below 16th level)[1, 2]	——	Vertical	3	3,146
No. 6 internal shaft (below 16th level)[2]	——	Vertical	5	4,097
No. 1 Dome extension shaft [3]	P.13191	Vertical	Old shaft	222
No. 1 Foley O'Brien shaft[3]	P.13403	Vertical	Old shaft	70
No. 2 Foley O'Brien shaft[3]	P.13403	Vertical	Old shaft	160
No. 3 Foley O'Brien shaft[3]	SW. corner, N.½, lot 2, con. II, Tisdale tp.	Vertical	Old shaft	240
Foley O'Brien winze (from 160 to 250 ft.)[3]	P.13403	70°	———	244
Temiskaming No. 1[3]	SW. corner SW.¼, N. ½, lot 3, con. II, Tisdale tp.	Vertical	———	60
Temiskaming No. 2[3]	NW. corner NW. ¼, S. ½, lot 3, con. II, Tisdale tp.	Vertical	———	260

[1]Not being used for hoisting.
[2]Connected with the main shaft on the 16th and 18th levels.
[3]Old shaft, not in use.

Development work in 1960 consisted of 9,805 feet of drifting; 5,245 feet of crosscutting; and 2,927 feet of raising. Total development footage to 31 December 1960 was as follows: 389,437 feet of drifts; 178,491 feet of crosscuts; and 228,055 feet of raises. Diamond-drilling in 1960 consisted of 522 holes, totalling 100,888 feet, from underground.

New construction in 1960 was as follows:

Crusher house (65 x 65 x 42 ft. high, steel construction, concrete floors).
Crusher annex (29 x 26 x 42 ft., high, same construction as crusher house).
No. 6 conveyorway (7 ft. wide, 8 ft. high, 460 ft. long, wood construction).
No. 7 conveyorway (7 x 8 ft., 520 ft. long, same construction as No. 6).
No. 1 crusher transfer house (28 x 28 x 21 ft. high, same construction as crusher house).
No. 2 transfer house (20 x 22 x 20 ft. high, same construction as conveyorway).
No. 3 transfer house (38 x 10 x 15 ft. high, wood construction, galvanized covered).

Equipment installed was as follows:

NEW CRUSHER HOUSE

1 crusher (Symons shorthead 5½-ft, Nordberg Mfg. Co.).
1 Simplicity grizzly vibrating feeder (42 x 144 ins., with 25-hp motor).
1 conveyor (54-in., 44-ft. centres, with 7.5 hp. motor).
3 rod deck screens (Symons, 4 x 8 ft., with 7.5-hp. motors, Nordberg Mfg. Co.).
2 vibrating feeders (Lockers No. 4, 3 x 3 ft., Mine Equipment Co. Ltd.).
1 belt conveyor (24-in., 48-ft. centres, with 5-hp. motor).
1 belt conveyor (36-in., 160-ft. centres, with 25-hp. motor).
1 belt conveyor (36-in., 80-ft. centres, with 40-hp. motor).
1 dust filter (Sly, size No. 62, Type 360, with 10,000 cfm. fan, 30-hp. motor).

TRANSFER HOUSES AND CONVEYORWAYS
1 electric vibrating feeder (Lockers, No. 5, 3 x 5 ft.), No. 1 transfer house.
1 electric vibrating feeder (Lockers, 2 x 8 ft.), No. 3 transfer house.
1 electric vibrating unit (Syntron model V-55), No. 2 transfer house.
1 dust filter (Sly, size No. 34, with 1,980 cfm. fan, 3-hp. motor) No. 1 transfer house.
1 belt conveyor (24-in., 550-ft. centres, with 10-hp. motor) No. 7 conveyorway.
1 belt conveyor, (24-in, 46-ft. centres, with 10-hp. motor) No. 6 conveyorway.

POWER HOUSE
2 boilers (gas-fired, 250-hp. at 125-psi Scotch Dry-Back type, Dominion Bridge).

The following is taken from the general manager's report for the year ending 31 December 1960:

Costs

The expenditure on development was $925,675 or $1.29 per ton, as compared with $860,993 or $1.21 per ton milled in 1959.

The expenditure on mining was $3,512,966 or $4.92 per ton, as compared with $3,404,473 or $4.77 per ton milled in 1959.

The total operating charges for the year were $5,691,468 or $7.96 per ton, as compared with $5,539,972 or $7.77 per ton milled in 1959.

Mining

The 714,600 tons of ore milled during the year were produced as follows:

Source of Ore	Mined	Average Grade
	tons	dwt. per ton
Stopes	622,800	5.30
Development	91,800	3.52
Total	714,600	5.07

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	3,180	3.85
Ankerite veins	200,584	4.46
Area serviced by No. 6 internal shaft	263,169	5.36
Remainder of mine	247,667	5.26
Total	714,600	5.07

Ore Reserves

Ore reserves at the close of the year were estimated at 2,476,000 tons, with an average grade of 5.18 pennyweight, as compared with 2,494,000 tons, with an average grade of 5.21 pennyweight, for 1959.

Source of Ore	1960	1959
	tons	tons
Unbroken	2,163,000	2,180,000
Broken	313,000	314,000
Total	2,476,000	2,494,000

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

Mill

Following are the milling results:

Ore treated	tons	714,600
Average per day worked	tons	1,985
Average grade	dwt. per ton	5.07
Extraction	dwt. per ton	4.94
Recovery	percent	97.39

General

Ore milled reached a new peak for the plant at 714,600 tons or 1,985 tons per day worked. Recovery improved for the first half of the year, but a more refractory ore during the latter half lowered over-all recovery to 97.39 percent. The grade of ore milled increased slightly, and with the increased tonnage and higher price for gold, production increased by $153,935.

Conversion of all plant heating from coal to natural gas was completed in the fall, with savings in labour and fuel costs. Early in the year, detailed cost studies indicated that substantial savings in operating labour and maintenance costs could be obtained by replacement of the old crushing and conveying equipment by a modern plant. The availability of good used equipment reduced the capital cost and made the project attractive. The new plant is located at No. 3 shaft headframe, and the crushed ore is conveyed by a 1,000-foot conveyor to the mill.

Further mechanization of the timber-yard and in handling of supplies and materials contributed to more efficient operation.

During the year three mining claims amounting to 120 acres, located 2,500 feet northeast from No. 3 shaft, were acquired.

The average number of employees was 912: 608 underground, and 304 on surface. C. P. Girdwood was general manager.

Golden Algoma Mines Limited

The property consists of 1,080 acres located in Township 28, range 26, District of Algoma. Under former operators it was known as the Goudreau, New Goudreau, Amherst, and Algold property. The head office address is 372 Bay Street, Toronto. The mine is at Goudreau.

The No. 1, two-compartment shaft inclined at 68 degrees had been sunk to a depth of 425 feet by former operators. Previous development work consisted of 590 feet of drifting and 60 feet of crosscutting, on the 100-foot level; 1,050 feet of drifting on the 200-foot level; 625 feet of drifting on the 400-foot level.

During 1960, 15 diamond-drill holes, totalling 3,258 feet, were completed from surface.

A. Lapierre was mine 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, general manager, and director; F. M. Connell, J. Y. Murdoch, H. L. Roscoe, 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 consists of eight claims in Whitney township, Porcupine area, District of Cochrane, adjoining the west boundary of the Pamour Porcupine mine.

Mining and milling continued throughout 1960.

The mine is serviced by the vertical, three-compartment No. 1 shaft, 3,477 feet deep, on the north half of lot 7, concession V, Whitney township. The inclined, two-compartment, 2230 winze, collared at 3,354 feet in depth and sunk 243 feet in 1959, was sunk a further 181 feet in 1960. The 24th level was established at a depth of 3,792 feet.

Development work in 1960 consisted of 1,602 feet of drifting, 859 feet of crosscutting, and 883 feet of raising. Total development footage to 31 December 1960 was as follows: 60,509 feet of drifts; 15,913 feet of crosscuts; 21,516 feet of raises. Diamond-drilling in 1960 consisted of 230 holes, totalling 26,931 feet, from underground and 3 holes, totalling 1,675 feet, from surface.

The following is taken from the manager's report for the year ending 31 December 1960:

Stoping

Ore broken in stopes amounted to 116,289 tons, and ore drawn off was 111,541 tons. The broken-ore reserve was increased to 11,638 tons.

About half of the tonnage mined came from stopes above the 8th level, and the remainder from the narrow veins below the 18th level.

Backfill placed in stopes amounted to 62,242 tons.

Ore Reserves

At 31 December 1960 the ore reserves were 169,898 tons of average cut grade of 0.35 ounces per ton. New ore developed during the year was some 15,000 tons less than the tonnage mined.

Mill

The mill was in continuous operation throughout the year except for short shutdowns for repairs, inspections, and statutory holidays. The 8- by 8-foot ball mill was in operation 8,433 hours or 96.3 percent of the possible running time.

Tonnage milled averaged 330 tons per day compared with 325 tons per day in 1959.

The mill treated 120,614 tons of ore averaging 0.351 ounces of gold per ton, with mill recovery at 97.37 percent.

The average number of employees was 194: 118 underground, and 76 on surface. W. J. Marshall was manager until the end of the year when he left to become manager of Pamour Porcupine Mines Limited. He was replaced by D. Bridger, formerly mine superintendent at Aunor Gold Mines Limited.

H. G. Young Mines Limited

H. G. Young Mines Limited was incorporated in January 1946, with an authorized capitalization of 5,000,000 shares of $1 par value, of which 3,948,845 shares have been issued. The directors and officers were: H. G. Young, chairman of the board; B. W. Lang, president and director; M. A. Cooper, vice-president and director; J. M. Godfrey, secretary and director; E. G. Bishop, J. B. Redpath, and J. B. Streit, directors; W. H. Maedel, treasurer. The head office is at 80 Richmond Street West, Toronto. The mine address is Box 130, Balmertown.

The property, consisting of 19 claims, is located in Balmer township, Red Lake area, District of Kenora (Patricia Portion). It adjoins part of the east boundary of the Campbell Red Lake property, and includes part of the land under the water of Balmer Lake.

Mining continued throughout the year; the mill commenced operating on 1 September 1960.

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 1960 consisted of 4,476 feet of drifting, 862 feet of crosscutting, and 3,038 feet of raising. Total development footage to 31 December 1960 was as follows; 6,834 feet of drifts; 4,640 feet of crosscuts; and 3,038 feet of raises. Diamond-drilling in 1960 consisted of 101 holes, totalling 19,075 feet, from underground.

The buildings, mill, and plant equipment formerly owned by Starratt-Olsen Gold Mines Limited was taken over and reconditioned by H. G. Young Mines Limited. New construction included a hoist-room addition (12 x 28 x 12 ft.) and a machine-shop addition (20 x 28 x 12 ft.) both Butler prefab steel buildings; a 200-ton ore bin; a compressor house; and a covered conveyor-way, of timber construction.

New equipment installed consisted of an air compressor (17 x 10.5 x 10 ins., 750 cfm. at 100-psi., Canadian Ingersoll-Rand, XVH-E2).

A total of 43,434 tons of ore was hoisted, and 35,200 tons was milled. The mill averaged 288.5 tons per day during the period of operation.

The average number of employees was 94: 38 underground, and 56 on surface. W. R. McDonald was manager.

Hollinger Consolidated Gold Mines Limited

Hollinger Consolidated Gold Mines Limited was incorporated in January 1916. The authorized capitalization is 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, president and director; L. H. Timmins, vice-president and director; P. C. Finlay, secretary and director; J. I. Rankin, treasurer and director; A. A. McMartin, N. A. Timmins, Hon. C. D. Howe, Hon. Edouard Asselin, Duncan McMartin, J. A. McDougald, and J. Y. Murdoch, directors; L. S. Weldon, executive vice-president. The mine office and head office are at Timmins. The general office is at 44 King Street West, Toronto.

The main property operated by the company is 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 1960.

SHAFTS, HOLLINGER MINE[1]

	Claim No.	Number of Compartments	Total Depth from Surface
			feet
Main shaft	P.13156	3	2,770
Central shaft	P.13157	6	3,195
No. 11 shaft	P.13144	2	2,756
No. 19 shaft	Schumacher veteran lot	3	3,954
No. 25 internal shaft (below 3,800-foot level)	——	3	5,477
No. 27 internal shaft (below 2,450-foot level)	——	4	5,277
No. 26 shaft	P.13156	5	3,063
No. 12 shaft	P.13142	2	[2]
No. 21 shaft	P.13157	2	[3]
No. 6 shaft	P.13218	2	[4]

[1]Includes the shafts and winzes in use, and four that have been partly filled. All others have been stoped, filled, or otherwise made inaccessible.
[2]Abandoned and filled from surface to the 800-foot level; travelway from the 800- to 1,400-foot levels.
[3]Filled from the 1,550- to 2,750-foot level; travelway from the 2,750- to 3,950-foot levels.
[4]Abandoned and filled from surface to the 200-foot level; travelway from the 200- to 425-foot levels.

Development work during the year consisted of 4,359 feet of drifting; 325 feet of crosscutting; and 26,892 feet of rock passes, development and stope raising. Total development from 1931 to 31 December 1960 is as follows; 1,290,029 feet of drifts; 679,612 feet of crosscuts; and 873,612 feet of raises. Diamond-drilling in 1960 consisted of 1,088 holes, totalling 94,726 feet, from underground.

The following is taken from the manager's report for the year ending 31 December 1960:

A greater tonnage of ore milled of a higher average grade resulted in increased income for 1960, in comparison with 1959. Offsetting this was an increase in operating costs which, in total, again exceeded bullion production, although by a smaller amount than in 1959.

Production figures and cost summaries for 1959 and 1960 are shown for comparison:

	1959	1960
Worked.....days	271	271
Milled.....tons	980,887	1,051,222
Millhead grade per ton.....oz.	0.273	0.278
Millhead value per ton.....	$ 9.20	$ 9.51
Average value of tailings per ton.....	$ 0.26	$ 0.26
Gold produced.....oz.	260,146	284,118
Average value received per oz. of gold sold.....	$ 33.59	$ 34.00
Bullion production.....	$8,771,010	$9,720,409
Operating cost (before taxes and depreciation).....	$9,194,899	$9,851,467

Costs

Distribution	Per Ton	
	1959	1960
Mining charges.....	$6.03	$6.17
Milling charges.....	0.87	0.79
General charges.....	1.14	1.11
Vacation pay, insurance, and other employee benefits.....	0.55	0.54
Administrative charges.....	0.79	0.76
Total.....	$9.38	$9.37

An increase in the work force was necessary to meet the added work and difficulty in mining ore remnants. An average of 161 places was worked each work-day of 1960, to produce an average of 3,875 tons per day; 239 places were finished, including 42 sill-pillar removals.

Rock broken was 2.97 tons per man-shift, the highest on record, and ore produced was 2.53 tons per man-shift compared with 2.47 tons per man-shift in 1959. The fact that the average cost per ton of ore milled remained almost the same, in spite of the 7-percent increase in tonnage over 1959, is indicative of the added difficulty in obtaining ore.

The price received for gold ranged from $33.26 per ounce to $34.82 per ounce and averaged $34.00 per ounce for each ounce sold; the year-end figure was $34.82 per ounce.

Some 1,051,000 tons were milled; the ore reserve was depleted by 367,000 tons, to 2,236,000 tons. The grade of the reserve is estimated to average 0.298 ounce of gold per ton, compared with 0.308 ounce at the end of 1959. The value per ton, with gold at $35.00 per ounce, is $10.45.

The average number of employees was 1,613: 998 underground, and 615 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 1960.

SHAFTS, ROSS MINE

	Location	Inclination	Number of Compartments	Sinking in 1960	Depth from Surface
					feet
No. 1 shaft.....	N. ½, lot 1, con II, Hislop tp.	Vertical	3	559	2,157
No. 2 winze (below 300-foot level).....	——	Vertical	2	——	1,535

No. 1 shaft was sunk 559 feet in 1960, and the 1,650-, 1,800-, 1,950-, and 2,100-foot levels were established.

Development work in 1960 consisted of 976 feet of drifting; 307 feet of crosscutting, and 1,039 feet of raising. Total development footage to 31 December 1960 was as follows: 38,742 feet of drifts; 30,688 feet of crosscuts; 25,376 feet of raises. Diamond-drilling in 1960 consisted of 128 holes, totalling 13,666 feet, from underground.

The following is taken from the resident manager's report for the year ending 31 December 1960:

The effect of the anticipated reduction in grade of ore milled was more than offset through savings realized by the additional tonnage processed and improved operating efficiency. The substantially lower cost per ton includes a wage increase equal to 8 cents per ton.

Operating statistics for 1959 and figures for 1960 are shown for comparison:

PRODUCTION

	1959	1960
Worked ..... days	348	345
Milled ..... tons	121,217	140,154
Millhead grade per ton ..... oz.	0.172	0.151
Millhead value per ton	$ 6.11	$ 5.64
Average value of tailings per ton	$ 0.59	$ 0.42
Gold produced ..... oz.	18,654	19,443
Average value received per ounce of gold sold	$ 33.54	$ 33.94
Bullion production	$669,435	$731,041
Operating cost (before taxes and depreciation)	$728,224	$779,403

COSTS

	Per Ton	
	1959	1960
Mining	$2.66	$2.48
Milling	1.91	1.73
General	0.84	0.74
Vacation pay, insurance, and other employees benefits	0.24	0.23
Administrative	0.36	0.38
Total	$6.01	$5.56

The improvement in performance reflects the advantage gained through changes and additions to the plant. Productivity in tons milled per man-shift averaged 5.12, the highest to date. This was an increase of 8.5 percent over 1959 and 16 percent over the last four years.

The ore reserve at the end of 1960 was 500,300 tons averaging 0.180 ounce of gold per ton, equal to $6.29 per ton with gold valued at $35 per ounce. The amount of the ore reserve was unchanged from the end of 1959 after milling 140,000 tons, but there was a reduction in average grade of 0.014 ounce of gold per ton.

The average number of employees was 102: 50 underground, and 52 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: B. W. Lang, president and director; J. B. Streit and R. A. Cranston, vice-presidents and directors; J. A. Hackett, director; W. H. Maedel, secretary-treasurer. The head office is at 80 Richmond Street West, Toronto. The mine address is Pamour.

The company owns 15 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 PORCUPINE MINE

	Claim No.	Inclination	Number of Compartments	Depth
				feet
Mulholland shaft	P.12708	Vertical	2	(1)200
Hughes shaft	P.13096	Vertical	2	(1)200
No. 1 winze (below 200-foot level)	——	70°	2	110

(1)Approximate.

These shafts are not in use at the present time. The work now being done on the property is through extensions of the Reef workings of Broulan Reef Mines Limited. All ore is hoisted through the Reef shaft.

Development footage in 1960 consisted of 477 feet of drifting, 205 feet of crosscutting, and 272 feet of raising. Total development footage to the end of 1960 was as follows: 17,050 feet of drifts; 1,669 feet of crosscuts; and 5,672 feet of raises. Diamond-drilling in 1960 consisted of 26 holes, totalling 5,321 feet, from underground.

The following is taken from the mine manager's report for the year ending 31 December 1960:

Ore Reserves

Proven ore reserves are calculated to be 50,013 tons having an average uncut grade of 0.39 ounces of gold per ton, or a grade cut to one ounce of 0.23 ounces per ton.

During the year, stopes were operated on the 200-, 500-, 650-, 1,720-, 1,870-, 2,050-, and 2,500-foot levels.

Operating costs for the 50,465 tons mined and milled during the year, including head office administration and general expenses, amounted to $7.04 per ton.

F. W. Dewar was mine manager. The employment figures were included with Broulan Reef Mines Limited report (*see* p. 18).

Kerr-Addison Gold Mines Limited

Keer-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: J. Y. Murdoch, chairman of the board; W. S. Row, president and director; H. L. Roscoe, vice-president and director; Andre Dorfman, F. M. Connell, K. C. Gray, H. H. Leather, and W. D. Smith, directors; B. C. Bone, treasurer; R. D. Stewart, secretary; O. W. Ptolemy, assistant secretary and assistant treasurer. The head office is at 44 King Street West, Toronto. The mine address is Virginiatown.

The company's main property consists of 34 claims in McGarry township, Larder Lake area, District of Timiskaming.

Mining and milling continued throughout 1960.

SHAFTS, KERR-ADDISON MINE

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

Development work in 1960 consisted of 5,555 feet of drifting, 8,045 feet of crosscutting, and 8,004 feet of raising. Total development footage to 31 December 1960 was as follows: 197,681 feet of drifts; 80,085 feet of crosscuts; and 147,959

feet of raises. Diamond-drilling in 1960 consisted of 329 holes, totalling 63,923 feet, from underground.

Equipment added in 1960 included the following:

1 Sly dust filter, at 5,700-foot crusher station, type 360 (McCarthy Robinson).
3 Locker electric vibrating feeders, type 5DS (Mine Equipment Co.).
1 Limberope conveyor (2,476 ft. long, with fluid drive, Joy Mfg. Co.).
1 conveyor belt (36 ins. wide, 4-ply, 5,312 ft. long, Dominion Rubber).
1 Alimak raise platform.
25 mine cars (3-ton).

The following is taken from the manager's report for the year ending 31 December 1960:

Mine Development and Mining

Development work during the year was concentrated mainly in the block of levels below the 3,850-foot level serviced by the new No. 4 internal shaft, which bottoms at a depth of 6,022 feet. The program in this area proceeded on a three-shifts-per-day basis throughout the year.

The ore-pass and the waste-pass systems, which are being driven upward from the 5,900-foot loading station to the 3,850-foot level and the 4,000-foot level, respectively, were nearly finished at the year's end. The crosscuts were advanced to connect with the ore- and waste-passes on all levels, and the installation of the ore-pass and the waste-pass control chutes and dumps was well under way.

The crusher station at the 5,700-foot level was excavated and concreted, and the installation of equipment was nearing completion.

Work on the 2,500-foot inclined conveyor from the 4,000-foot level at No. 4 shaft to the 3,850-foot level at No. 3 shaft proceeded during the year. The ore-pass and the waste-pass from the lower end of the conveyor to the skipdump above the 3,850-foot level in No. 4 shaft were driven, and the conveyor-feed control chutes and vibratory feeders were installed. The conveyor equipment has been erected except for the head-end and the drive.

A return-air raise was driven from the 4,000-foot level to connect with the return-air system, which previously extended down to the 3,850-foot level.

On the 4,000-foot, 4,200-foot, and 4,400-foot levels the crosscuts were advanced, and drifts were driven parallel to, and about 75 feet to the north of, the flow-ore zone as far as its known easterly limit. On the 4,600-foot level the crosscut was advanced to within 370 feet of the projected position of the ore zone, and a pilot hole was drilled to test ground conditions ahead of the crosscut.

On the 4,800-foot and the 5,600-foot levels, major exploration programs were initiated, designed to investigate a strike length of about 6,500 feet on each level. On the 4,800-foot level, the east and west drifts were advanced, and a strike length of about 1,700-feet has been covered. On the 5,600-foot level, the main crosscut was advanced, and a pilot hole was drilled, which revealed a large mass of talc, 300 feet wide, between the crosscut and the projection of the ore zone. A drift is being driven to the east to seek firmer ground for the continuation of the crosscut.

Cut-and-fill mining of various types accounted for the bulk of the tonnage broken, as shown in the following tabulation. A minor amount of ore was broken in shrinkage stopes and development headings.

Mining Method	1960		1959	
	Broken	Of Total	Broken	Of Total
	tons	percent	tons	percent
Cut-and-fill stoping	1,101,226	69.7	1,103,364	71.4
Square-set stoping	109,146	6.9	84,765	5.4
Cut-and-fill pillar recovery	133,579	8.4	155,648	10.1
Square-set pillar recovery	97,615	6.2	66,485	4.3
Total cut-and-fill mining	1,441,566	91.2	1,410,262	91.2
Shrinkage stoping	114,617	7.3	108,347	7.0
Total stoping	1,556,183	98.5	1,518,609	98.2
Development ore	23,797	1.5	27,447	1.8
Total ore broken	1,579,980	100.0	1,546,056	100.0
Tons milled ..... percent	94.7	——	93.0	——

A total of 787,673 cubic yards of backfill was placed in the mine during the year, 69,813 cubic yards more than in 1959. The backfill placed included: 698,873 cubic yards of hydraulic sand recovered from mill tailings; 5,123 cubic yards of screened, hydraulic pit-sand; and 83,593 cubic yards of development waste. Cut-and-fill mining utilized 79.2 percent of the backfill placed.

Production and Cost

The total value of production in 1960 exceeded $20,000,000 for the first time in the history of the company, reflecting an improvement in the grade of the ore milled and in the price received for gold. A record operating profit was obtained in spite of slightly higher operating costs. The retreatment of cyanidation tailings increased the recovery of gold from 92.0 percent to 97.8 percent, a difference of 5.8 percent as compared with 5.2 percent in 1959, and showed an operating profit for the year of $982,814.60, or 59 cents per ton milled.

SUMMARY OF PRODUCTION FOR 1960 AND 1959

	1960	1959
Milled ..... tons	1,667,638	1,662,534
Average milled per day ..... tons	4,556.4	4,554.9
Total gold recovered ..... oz.	592,244.59	567,304.80
Total silver recovered ..... oz.	33,370.60	31,863.99
Average gold recovery per ton ..... oz.	0.3552	0.3412
Value gold recovery per ton (at $35 per oz.)	$12.4299	$11.9430
Average tailings loss per ton ..... oz.	0.0081	0.0077
Value tailings loss per ton (at $35 per oz.)	$0.2848	$0.2674
Average mill head per ton (bullion plus tails) ..... oz.	0.3633	0.3489
Average mill head value per ton (at $35 per oz.)	$12.7147	$12.2104
Recovery ..... percent	97.8	97.8
Total realized value of bullion (Canadian funds)	$20,420,105.55	$19,125,030.10
Total realized value of bullion per ounce of gold	$34.48	$33.71
Total realized value of bullion per ton	$12.245	$11.504

COST SUMMARY

Distribution	1960		1959	
	In Full	Per Ton	In Full	Per Ton
Development	$ 919,767.68	$0.552	$ 823,865.31	$0.496
Stope development	246,324.96	0.148	407,792.79	0.245
Mining	3,825,619.69	2.294	3,557,330.61	2.140
Haulage	578,361.59	0.346	585,235.70	0.352
Hoisting	408,864.38	0.245	393,775.61	0.237
General mine charges	2,287,265.82	1.371	2,165,963.31	1.302
Crushing and conveying	238,525.34	0.143	254,257.86	0.153
Milling	1,479,002.29	0.887	1,542,296.17	0.928
General expense	729,768.38	0.438	693,423.58	0.417
Bullion marketing	135,950.84	0.082	136,657.59	0.082
Total	$10,849,450.97	$6.506	$10,560,598.53	$6.352
Net operating profit at mine (before provision for Depreciation, taxes and head office expense)	$ 9,570,654.58	$5.739	$ 8,564,431.57	$5.152

Ore Reserves

At the year's end, proven ore reserves after allowing for dilution were as follows:

Level	Ore	Grade
	tons	oz. per ton
Surface to 1,600-foot	681,270	0.2695
1,600-foot to 2,500-foot	2,960,316	0.3166
2,500-foot to 3,700-foot	2,731,915	0.4278
3,700-foot to 4,550-foot horizon	2,701,188	0.5473
Total reserve at the end of 1960	9,074,689	0.4152
Total reserve at the end of 1959	9,641,937	0.3908

Broken-ore reserves, amounting to 72,744 tons having a grade of 0.2509 ounces per ton at the end of 1960, are included in the foregoing figures. The total ore reserves show a decrease of 567,248 tons from the position at the end of 1959. The tonnage milled during the year exceeded the tonnage of new ore added to reserves by 453,263 tons. In addition, some unrecoverable pillar remnants were removed from ore classification, and ore estimates were revised downward in some cases where additional information was obtained in the course of mining. These factors were offset to a considerable degree by additional ore won in mining, but the result was an additional net reduction of ore reserves, amounting to 113,985 tons.

The average number of employees was 1,492: 1,044 underground, and 448 on surface. R. J. Beggs was manager.

Kirkland Minerals Corporation Limited

Kirkland Lake Gold Mining Company Limited was incorporated in November 1915, with an authorized capitalization of 5,500,000 shares of $1 par value. In April 1956, the company was reorganized, and the name was changed to Kirkland Minerals Corporation Limited. The authorized capitalization was changed to 5,000,000 shares of $1 par value, 3,550,005 of which have been issued. The directors and officers were: E. A. Glick, managing director; S. G. Taylor, president and director; I. A. Wallace, vice-president and director; Robert Martin and H. L. Pountney, directors; Myrtle L. Irvine, secretary-treasurer; Camilla Lillico, assistant secretary-treasurer. The executive office is at 160 Bay Street, Toronto. The mine address is Box 850, Chaput-Hughes. The mine was under the management of Sulmac Exploration Services Limited.

The company's main property is the former Kirkland Lake gold mine, now known as the Kirkland Minerals mine. It consists of 11 claims in Teck township, Kirkland Lake area, District of Timiskaming. The company also controls Norstar Lake Mines Limited.

Mining continued from 1 January to 27 August, 1960; milling from 1 January to 23 September, 1960, at the Kirkland Minerals property, which was later purchased by Teck-Hughes Gold Mines Limited.

SHAFTS AND WINZES, KIRKLAND MINERALS MINE

	Claim No.	Inclination	Number of Compartments	Total Depth from Surface
				feet
No. 1 shaft (inactive)	L.1236	Vertical	2	894
No. 2 or main shaft	L.1236	Vertical	3	2,666
No. 1 winze (below 2,475-foot level)	——	Vertical	4 to 2,975 ft. 3 below 2,975 ft.	5,897
No. 2 winze (below 4,900-foot level)	——	Vertical	3	5,897
No. 3 winze (below 3,600-foot level)	——	Vertical	3	4,487
"1,000" winze (below 1,000-foot level)	——	Vertical	2	1,134
No. 4 winze (below 4,750-foot level)	——	Vertical	3	6,003

No. 4 winze was sunk 115 feet in 1960 to a depth of 6,003 feet below surface. The 5,975-foot level was established.

Annual Report

The following table gives the development footage in 1960, and the total footages to the time operations were suspended on 23 September 1960.

UNDERGROUND DEVELOPMENT, KIRKLAND MINERALS MINE

Level	Drifts		Crosscuts		Raises	
	1960	Total	1960	Total	1960	Total
	feet	feet	feet	feet	feet	feet
No. 2 (MAIN) SHAFT:						
100-foot	——	——	——	——	——	170.7
200-foot	——	——	——	——	——	96.0
300-foot	——	——	——	——	——	179.0
400-foot	——	213.0	——	172.0	——	108.5
500-foot	——	445.0	——	345.0	——	58.0
600-foot	——	987.2	——	206.0	——	——
700-foot	——	251.0	——	107.0	——	——
800-foot	——	1,918.0	——	470.0	——	287.0
900-foot	——	754.0	——	391.0	——	185.0
1,000-foot	——	1,990.0	——	387.0	——	365.0
1,100 (sublevel from 1,000-foot)	——	552.0	——	236.0	——	173.0
1,200-foot	——	1,698.0	——	379.0	——	196.0
1,300-foot	——	1,484.0	——	648.0	——	321.0
1,400-foot	——	——	——	17.0	——	——
1,500-foot	——	——	——	19.0	——	284.0
1,600-foot	——	2,614.0	——	1,892.5	——	——
1,725-foot	——	——	——	27.0	——	168.0
1,850-foot	——	786.8	——	256.0	——	388.5
1,975-foot	——	1,185.6	——	499.0	——	230.5
2,100-foot	——	1,019.0	——	238.0	——	171.0
2,225-foot	——	774.0	——	464.0	——	174.0
2,350-foot	——	1,574.6	——	426.1	——	572.1
2,475-foot	——	2,067.6	——	765.5	——	837.7
No. 1 WINZE:						
2,600-foot	——	961.0	——	472.5	——	348.9
2,725-foot	——	1,693.0	——	259.0	——	505.9
2,850-foot	——	2,196.0	——	310.0	——	91.0
2,975-foot	——	1,550.0	——	282.0	——	365.0
3,100-foot	——	1,396.0	——	195.0	——	153.0
3,225-foot	——	1,604.6	——	402.4	——	683.9
3,375-foot	——	1,007.3	——	84.0	——	166.0
3,475-foot	——	1,587.0	——	677.0	——	265.0
3,600-foot	——	2,461.0	——	3,401.0	——	239.0
3,750-foot	——	3,337.0	——	796.0	——	412.1
3,875-foot	——	3,465.9	——	1,728.5	——	611.1
4,000-foot	——	1,435.0	——	821.0	——	——
4,150-foot	——	2,332.5	——	950.0	——	228.0
4,300-foot	——	4,503.2	——	1,462.0	——	474.6
4,450-foot	——	7,689.1	——	2,293.5	——	988.5
4,600-foot	——	5,037.8	22.5	1,952.8	38.0	680.2
4,750-foot	42.5	4,156.5	——	2,517.6	119.0	1,817.6
4,900-foot	——	5,389.9	——	1,598.7	——	1,175.2
No. 2 WINZE:						
5,050-foot	——	1,108.0	——	516.0	——	245.0
5,200-foot	——	197.0	——	320.0	——	96.0
5,325-foot	——	723.0	——	210.0	——	383.0
5,450-foot	——	9,649.5	——	2,243.4	60.5	2,786.8
5,600-foot	——	1,027.0	——	70.0	——	310.0
5,725-foot	——	51.0	——	7.0	——	——
5,850-foot	——	2,289.8	——	2,088.9	——	449.1
No. 3 WINZE:						
3,725-foot	——	296.5	——	321.0	——	165.0
3,850-foot	——	360.0	——	192.0	——	165.0
3,975-foot	——	668.5	——	214.0	——	165.0
4,100-foot	——	903.5	——	152.0	——	207.0
4,225-foot	——	834.0	——	181.0	——	142.0
4,350-foot	——	1,136.0	——	254.0	——	220.0

UNDERGROUND DEVELOPMENT, KIRKLAND MINERALS MINE—*Continued*

Level	Drifts		Crosscuts		Raises	
	1960	Total	1960	Total	1960	Total
	feet	feet	feet	feet	feet	feet
No. 4 WINZE:						
5,010-foot	——	2,800.0	——	395.8	——	917.1
5,120-foot	——	1,655.2	——	418.2	——	477.2
5,230-foot	——	3,358.7	——	910.2	——	450.9
5,340-foot	31.4	5,557.6	——	1,032.1	130.0	1,468.7
5,600-foot	——	5,001.8	——	668.8	40.0	1,491.3
5,725-foot	154.5	3,841.1	——	1,213.2	169.3	1,756.2
5,975-foot	155.5	155.5	196.0	196.0	——	——
Total	383.9	113,730.3	218.5	39,751.7	556.8	26,065.3

Diamond-drilling in 1960 consisted of some 135 holes, totalling 3,622 feet, from underground.

The average number of employees was 141: 89 underground, and 52 on surface. A. R. Farrell, mechanical superintendent, was in charge.

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, vice-president in charge of operations and director; J. C. L. Allen and S. J. Bird, directors; B. A. Argo, secretary; H. W. Wright, comptroller. The head office and mine office are 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 mill operations continued throughout 1960.

SHAFTS, LAKE SHORE MINE

	Claim No.	Inclination	Number of Compartments	Total Depth from Surface
				feet
No. 1 shaft (surface to 2,200-foot level)	L.1557	Vertical	3	2,250
No. 1 shaft extension (2,000–4,450-foot level)[1]	——	Vertical	3	4,500
No. 4 shaft (below 4,325-foot level)[2]	——	Vertical	3	8,176
No. 2 shaft[3]	L.2243	19°	1	[4]200
No. 3 shaft	L.2506	Vertical	5	3,995
No. 5 shaft	L.2506	Vertical	5	3,995
No. 6 shaft (below 3,575-foot level)[5]	——	Vertical	5	6,098

[1]Not being used.
[2]Hoist at 5,575-foot level.
[3]Used for supplies and timber only.
[4]Inclined distance, 632 feet.
[5]Hoist at 3,825-foot level.

Development work during the year consisted of 1,418 feet of drifting; 1,915 feet of crosscutting; and 1,152 feet of raising. Total development footage to 31 December 1960 was as follows: 273,982 feet of drifts; 106,949 feet of crosscuts;

151,455 feet of raises. Diamond-drilling in 1960 consisted of 92 holes totalling 8,842 feet, from underground.

The following is taken from the general manager's report for the year ending December 31 1960:

Operating Costs

Operating expense for 1960, before provision for depreciation, totalled $2,515,025, equivalent to $14.33 per ton of ore milled, as compared with $2,528,738 or $14.00 per ton in 1959. Operating costs per ton of ore milled for the last two years are tabulated below:

	Per Ton Milled	
	1960	1959
Mine development	$ 1.196	$ 0.754
Mining	7.679	7.782
Milling	2.107	2.062
Marketing expenses	0.109	0.105
General expense at the property	1.939	1.995
Mine office and supervision	0.960	0.926
Provincial mining tax	0.005	——
Administrative and corporate expense	0.335	0.380
Total Operating Cost	$14.330	$14.004

Higher expenditures for lower-level mine development account for the rise in total operating cost of $0.326 per ton of ore milled.

Freight and express charges paid in the year amounted to $30,287. A total of $1,634,076 was paid for wages, salaries, and incentive bonuses, compared with $1,640,710 for the preceding year.

Milling

In the year, the mill treated 175,501 tons of Lake Shore ore for an average daily milling rate of 480 tons, compared with 180,577 total tons and 495 tons per day in 1959. Recovery was 97.38 percent of contained gold in 1960, as against 97.31 percent in 1959.

The mill also treated 164,985 tons of ore from Wright-Hargreaves Mines Limited, equivalent to 451 tons per day for the period. Additionally, 149,748 tons of cyanide tailings, from the mill of Macassa Mines Limited, were processed in the tailings retreatment plant.

Mining

Ore production was from twenty-six 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:

	From Development	From Stoping	Total	Of Total	Hoisting Stages
	tons	tons	tons	percent	
Surface to 3,950-foot level	543	38,330	38,873	22.1	1
4,075-foot level to 6,075-foot level	6,026	87,472	93,498	53.3	2
Below 6,075-foot level	8,415	34,715	43,130	24.6	3
Total	14,984	160,517	175,501	100.0	——

Of the total ore produced, 8.5 percent came from development work, compared with 4.7 percent in 1959.

At the year's end the total footage of ore exposed in drifts and available for stoping was 9,445 feet, grading 0.526 ounce per ton over a width in the drifts, before slashing, of 55.8 inches. The average grade of this drift ore is up 0.027 ounce per ton from the comparable figure at the end of 1959, reflecting the substantially higher average gold content of the ore exposed by drifting during the year on the lower levels in the mine.

The average number of employees was 461: 273 underground, and 188 on surface. W. T. Robson was general manager.

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. The mine address is Beardmore.

The property, comprising 51 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 1960.

SHAFTS, LEITCH MINE

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

Development work during the year consisted of 939 feet of drifting; 1,295 feet of crosscutting; and 678 feet of raising. Total development footage to 31 December 1960 was as follows: 59,445 feet of drifts; 23,737 feet of crosscuts; 27,090 feet of raises. Diamond-drilling in 1960 consisted of 14 holes, totalling 3,796 feet, from underground.

The following is taken from the director and mine manager's report for the year ending 31 December 1960:

Ore Reserves

Ore reserves to the 28th level are estimated at 104,267 tons grading 1.094 ounces per ton for a total of 114,000 ounces.

Hoisting

A total of 42,822 tons of ore was hoisted: 1,274 tons or 3.0 percent from drifts, 1,073 tons or 2.5 percent from raises, and 40,475 tons or 94.5 from stopes; 11,181 tons of waste was hoisted.

Costs

Operating costs for 1960 are as follows:

	Per Ton Milled
EXPLORATION AND DEVELOPMENT	
Station-cutting	$ 0.11
Sump cutting	0.04
Crosscutting	1.69
Drifting	1.23
Raising	0.53
Underground diamond-drilling	0.30
Deferred development (shaft-sinking and station-cutting)	1.54
Total, Exploration and Development	$ 5.44
Mining, per ton milled	18.07
Milling, per ton milled	5.86
Total Operating Cost	$29.37

The above total operating cost of $29.37 per ton milled is sharply higher than last year's figure of $23.96. The increase is due to the greater amount of development work done, generally higher over-all mining costs caused by greater depth, and the decrease in tonnage milled. The effects were mitigated by the increase in grade of ore. Exploration and development costs increased from $3.11 per ton milled last year to $5.44, mining costs from $15.62 to $18.07, and milling costs from $5.23 to $5.86.

Unit costs also increased during the year as follows:

	1958	1959	1960
Crosscutting and drifting, per foot advance	$33.25	$33.15	$40.14
Raising, per foot advance	21.00	20.93	25.15
Mining, per ton broken	10.60	11.96	14.65
Milling, per ton milled	4.62	5.23	5.86

Prices of materials and supplies continue to rise. At 1 November, Hydro power rates increased by 10 percent. Labour costs are higher owing to increases in wage rates and benefits and increased labour force.

General

Present indications are that the trend to lower tonnages of higher grade ore will continue. Production increased sharply over 1959 owing mainly to the higher grade of ore mined. Tailing losses averaged 0.041 ounces per ton milled. Extraction was 96.59 percent.

Labour turnover was extremely high during the spring and summer months and interfered substantially with production schedules. At the end of the year turnover had been reduced to normal proportions, and operations became stabilized.

The main compressed-air line in the shaft was replaced down to the 15th level. Various renovation jobs were done throughout the mine and plant.

The average number of employees was 136: 69 underground, and 67 on surface. G. A. McKay was director and mine 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 3,349,005 shares have been issued. The directors and officers were: J. E. Ayrhart, president and director; W. G. Maddock, vice-president and director; I. A. MacNaughtan, secretary-treasurer and director; Reino Jalonen and Michael Plecha, directors. The head office is at 17 Queen Street East, Toronto 1. The mine address is Sapawe.

The property comprises 52 claims in McCaul and Hutchinson townships, District of Rainy River, about 4½ miles north of Sapawe and is connected to the Atikokan highway by road.

The vertical, three-compartment No. 1 shaft was collared in claim F.F.3417 and had been sunk 26 feet in 1960. Some 28 diamond-drill holes, totalling 7,270 feet, were completed from surface.

New construction included: a hoistroom (28 x 40 ft.); a bunkhouse (20 x 40 ft.); a powder magazine (16 x 16 ft.); a fuse house (6 x 8 ft.); an office and warehouse (20 x 40 ft.); a machine shop (20 x 20 ft.); a headframe (75-ft., B.C. fir); and a water tank (24,000 gals.).

New equipment installed was as follows:

1 double-drum hoist (48 x 36 ins. with 150-hp. motor, Canadian Ingersoll-Rand).
1 air compressor (19.5 x 12 x 10 ins. XVHE-2, with 200-hp. motor, Canadian Ingersoll-Rand).
1 air receiver (4 x 12 ft., 1,000-cfm.).

C. T. Penney was mine manager, and the average number of employees was nine.

Macassa Mines Limited

Macassa Mines Limited was incorporated in April 1926, with an authorized capitalization of 3,000,000 shares of $1 par value, of which 2,678,068 have been issued. The directors and officers were: R. A. Bryce, president and director;

J. D. Bryce, executive vice-president and director; Larmour Soliague, assistant to the president and director; C. R. Leonard, C. C. Huston, J. C. L. Allen, and J. G. Boeckh, directors; H. W. Salthouse, secretary-treasurer. The head office is at 85 Richmond Street West, Toronto. The mine address is Kirkland Lake.

The company's property consists of eleven claims in Teck township, Kirkland Lake area, District of Timiskaming.

Mining and milling operations continued throughout 1960.

SHAFTS, MACASSA MINE

	Claim No.	Inclination	Number of Compartments	Depth from Surface
				feet
Elliott shaft[1]	L.1617	Vertical	2	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	5,756

[1]Not being used.

The depth of No. 2 shaft was increased by 563 feet in 1960, to a total depth of 4,633 feet below surface, by raising and slashing.

Development work during the year consisted of 5,566 feet of drifting; 1,220 feet of crosscutting and 1,331 feet of raising. Total development footage to 31 December 1960 was as follows: 139,055 feet of drifts; 44,687 feet of crosscuts; 28,356 feet of raises. Diamond-drilling in 1960 consisted of 82 holes, totalling 15,550 feet, from underground.

New equipment installed underground included the following:

6 transformers (3kva. Pyranol, Mednick Metals).
3 transformers (5kva. potential, Canadian General Electric).
12 cap lamps (Nife, Safety Supply Company).
4 rock drills (Gardner Denver).
1 pump (reciprocating, Gardner Denver).
1 pump (duplex air, Canadian Fairbanks Morse).
1 air receiver, (42- by 18-in. Wabi Iron Works).
1 air fan (Meca).

The following is taken from the mine manager's report for the year ending 31 December 1960:

Milling

For the year, 149,862 tons were milled giving an average of 409.5 tons per calendar day. The over-all extraction was 93.90 percent.

Ore Reserves

Calculations based on sample results from drifting, raising, and extension of known veins by stoping operations show ore reserves, as at 31 December 1960, are:

Source of Ore	Reserve	Average Grade	Value (Gold at $35 per ounce)
	tons	oz. per ton	
Unbroken	841,000	0.4489	$15.71
Broken	44,320	0.4105	$14.37
Total and Average	885,320	0.4469	$15.64

Note: A dilution factor of 10 percent has been applied to grade only.

Unbroken ore is down 11,800 tons. Broken ore is up 5,344 tons. Therefore, total ore reserve is down 6,456 tons from 31 December 1959. Calculated grade is $15.64, as above, compared to $15.82 for the year 1959.

Costs

The following tabulation compares operating and other costs per ton milled and per ounce produced:

Distribution	Costs 1960		Costs 1959	
	69,778.097 ounces recovered from 149,862 tons milled		69,366.522 ounces recovered from 158,130 tons milled	
	Per Ton	Per Ounce	Per Ton	Per Ounce
Development and exploration	$ 1.83	$ 3.93	$ 1.58	$ 3.61
Mining	7.20	15.45	6.39	14.56
Milling	2.02	4.34	1.84	4.19
Undistributed mine operating charges	0.50	1.07	0.46	1.04
Administration and head office	0.57	1.23	0.56	1.28
Total	$12.12	$26.02	$10.83	$24.68
Depreciation	0.26	0.57	0.30	0.69
Provision for municipal, provincial and Federal taxes	0.88	1.89	0.98	2.24
Total	$13.26	$28.48	$12.11	$27.61

The average number of employees was 309: 210 underground, and 99 on surface. M. R. MacPherson was mine manager.

McIntyre Porcupine Mines Limited

McIntyre Porcupine Mines Limited was incorporated in March 1911, with an authorized capitalization of 800,000 shares of $5 par value, of which 798,000 shares had been issued. In December 1959, the authorized capitalization was subdivided on a 3-for-1 basis and increased to 3,000,000 shares without par value, of which 2,301,232 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; R. S. McLaughlin, J. C. Fraser, Norman D'Arcy, and S. M. Wedd, directors; M. L. Urquhart, vice-president (operations); F. T. McKinney, secretary. The address of the head office and the mine office is Schumacher. The executive office is at 25 King Street West, Toronto.

The company has numerous holdings in Ontario; the chief of them is the McIntyre mine, comprising 3,542 acres in Tisdale township, Porcupine area, District of Cochrane. In 1959 six claims, comprising 240 acres adjoining the McIntyre mine on the east, had been purchased from Central Porcupine Mines Limited. During the year all the assets and undertakings of Castle-Trethewey Mines Limited were purchased by McIntyre, and the Castle mine is operated as a division of McIntyre.

Mining and milling at the McIntyre mine continued throughout 1960.

SHAFTS, MCINTYRE MINE

	Claim No.	Number of Compartments	Total Depth from Surface
			feet
No. 1 shaft[1]	P.13307	3	307
No. 2 shaft[1]	P.13307	2	183
No. 3 shaft [1]	P.13307	2	183
No. 4 shaft [1]	P.13307	2	998
No. 5 shaft	P.13307	2 to 1,375 ft. 3 to bottom	2,389
No. 6 shaft	P.13710	3 to 1,050 ft. 4 to bottom	3,015
No. 7 shaft[1]	P.13318	2 to 200 ft. 3 to bottom	989
No. 8 shaft[1]	P.13318	2	288
No. 9 shaft[1]	P.13068	2	204
No. 10 shaft[1]	P.13068	2	185
No. 11 or main shaft	P.13318	5	4,130
No. 12 internal (below 3,875-ft. level)	——	4	7,007
No. 14 internal (below 3,750-ft. level)	——	4	7,094
No. 15 internal (below 6,825-ft. level)	——	4	6,825
"C-C" winze (below 5,500-ft. level[2]	——	3	6,837

[1]Not in use.
[2]Accessible from the Coniaurum mine only.

The No. 15 internal shaft hoistroom and sheaves are on the 6,575-foot level. Mining of the ore between the 6,575- and 6,825-foot levels had been completed; sinking of the internal shaft below the 6,825-foot level to a depth of 7,875 feet has been scheduled.

Development work during the year consisted of 19,094 feet of drifting, 6,005 feet of crosscutting, and 1,383 feet of raising. Total development footage to 31 December 1960 was as follows: 624,771 feet of drifts; 284,754 feet of crosscuts; 59,089 feet of raises. Diamond-drilling in 1960 consisted of 1,098 holes, totalling 219,345 feet, from underground.

Construction in 1960 included alterations to the airport hangar and assay office, and alterations and additions to the manager's dwelling.

New equipment added included the following:

1 Alimak raise platform (Mine Equipment).
1 motor (250-hp., serial 75-1206, Mine Equipment).
1 hoist (double-drum, single-clutch, 72 x 42 ins., Nordberg Mfg. Co.).
1 mine hoist drive (250-hp., Canadian General Electric).
1 fused starter (high-voltage, CEMA-class E2 Ampgard, Canadian Westinghouse).
18 mine cars (40 cu. ft. Granby, Wabi Iron Works).

The following is taken from the annual report for the year ending 31 December 1960:

Development work amounted to 26,466 feet, which included 1,270 feet in the copper zone. Included in the above was 18,873 feet of drifting—18,655 feet for gold and 218 feet for copper—of which 4,020 feet or 21.6 percent was in gold ore averaging 0.292 ounce per ton over a width of 7.9 feet. About 26.5 percent of the gold ore developed was above the 3,875-foot level.

All preliminary drifting, crosscutting, station-cutting, raising, shaft-slashing, and timbering for No. 15 shaft between the 6,575- and 6,825-foot levels was completed during the year. The sinking contract from the 6,825-foot level has been awarded, and the work is now under way.

Three claims, comprising 120 acres located away from the company's property and adjacent to Dome Mines Limited, were sold to Dome for cash and a retained interest in any ore mined.

The geological re-study of the mine, referred to in the last two Annual Reports, was continued in 1960 and will be completed in 1961. So far, a small amount of exploration work including drifting and diamond-drilling has been done in conjunction with the study. A lens of gold ore has been

indicated on the 600-foot level, and it is expected further work will develop some additional ore. Four long exploratory holes probed what are considered to be two structurally favourable areas. Two of these holes were drilled across the Pearl Lake porphyry on the 1,000-foot level, and one cut copper-gold ore in the copper zone. The other two holes were drilled from the 1,500-foot level to test a refolded area about 1,000 feet north of the present workings. Both holes intersected some low gold values, but it is too early to say whether these are important.

The mineralized copper zone in the Pearl Lake porphyry was further explored during 1960. Diamond-drilling now totals 70,800 feet in 168 holes. The zone was investigated by crosscuts on the 1,625- and 1,875-foot levels, and by detailed drilling to test grade and continuity in the crosscut areas. Results in the 1,625-foot crosscut area confirmed earlier diamond-drilling, but in the 1,875-foot crosscut area the detailed work confirmed the erratic results of earlier drilling.

An area between the 1,625- and 3,375-foot levels is now being blocked out by detailed exploration and is estimated to contain 4,800,000 tons grading 1.04 percent copper and 0.023 ounce gold.

The copper mineralization has not been delimited, either upward or downward, but is known to extend from the 1,125- to the 3,500-foot horizon. So far it is confined to a sector of the Pearl Lake porphyry, 300–400 feet wide and 1,300 feet long, containing mineralized lenses up to 125 feet wide and 700 feet long.

	1960	1959
Mining and development	$6,877,955	$6,685,513
Crushing, conveying, and milling	1,069,413	1,005,277
Administrative and general expense	552,984	454,557
Marketing expense	177,734	177,675
Provincial royalties	12,381	47,984
Municipal and provincial taxes, and lease rentals	57,548	70,227
Total	$8,748,015	$8,441,233
Depreciation	265,330	214,192
Net Total	$9,013,345	$8,655,425

Ore Reserves

	1960		1959	
	Tons	Ounces of Gold	Tons	Ounces of Gold
Estimated in place	1,958,385	631,022	2,070,185	668,831
Broken ore	50,886	13,033	56,114	13,977
Total	2,009,271	644,055	2,126,299	682,808
Average grade per ton	——	0.321	——	0.321

The average number of employees was 1,281: 849 underground, and 432 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 of $1 par value, of which 4,202,623 shares have been issued. The directors and officers were: S. J. Bird, president and director; J. G. Boeckh, vice-president and director; J. C. L. Allen and R. C. Stanley Jr., directors; Miss B. A. Argo, secretary-treasurer. The head office is at 199 Bay Street, Toronto 1. The mine address is McKenzie Island.

The property consists of 12 claims at the north end of Mackenzie Island in Red Lake, Dome township, District of Kenora (Patricia Portion).

Mining and milling operations continued throughout 1960.

SHAFTS, MCKENZIE RED LAKE MINE

	Claim No.	Inclination	Number of Compartments	Total Depth from Surface
				feet
No. 1 shaft	K.R.L.87	Vertical	3	456
No. 2 winze (below 250-foot level)	——	36°	3	1,275
No. 4 winze (below 1,250-foot level)	——	Vertical	3	1,635
No. 5 shaft	K.R.L.87	47½°	3	1,600

The mine is being operated through No. 5 shaft. No. 1 shaft has been abandoned.

Development work in 1960 consisted of 1,826 feet of drifting, 2,249 feet of crosscutting, and 3,477 feet of raising. Total development footage to 31 December 1960 was as follows: 92,915 feet of drifts; 28,078 feet of crosscuts; 52,453 feet of raises. Diamond-drilling in 1960 consisted of 82 holes totalling 9,433 feet, from underground.

A new ventilation-fan house and addition to the engineering office was completed. A ventilation fan (Woods 48-inch), and two slushers (Peacock Rotorair, 15-hp. and 10-hp.) were added equipment.

The following is taken from the mine manager's report for the year ending 31 December 1960:

Operating Costs

Distribution	1960 In Full	1960 Per Ton Milled	1959 Per Ton Milled
Exploration and development	$167,739	$2.02	$1.46
Mining	310,261	3.73	3.94
Milling	156,332	1.89	1.89
General expense at property	92,513	1.11	1.23
Mine office and supervision	52,650	0.62	0.60
Head office	31,397	0.38	0.41
Total	$810,892	$9.75	$9.53

A 24-percent increase in development footage is responsible for the higher operating costs in 1960.

Exploration

Diamond-drilling in the South mine, from the 1,450-foot level, partially outlined one of the largest hanging-wall structures ever found at McKenzie. It is 700 feet long and still open to the south.

Values in the drilling were low, but drifting along the structure has shown that ore occurs in short narrow shoots with values remarkably persistent up-dip. At the year's end, drifting had advanced 340 feet along this structure, and 245 feet, or 72 percent, was in ore that averaged 0.381 ounces across an average width of 3.05 feet.

Ore Position

The ability of the mine to maintain production in 1962 will depend on development results in the new hanging-wall structure in the south mine.

The average number of employees was 106: 66 underground, and 40 on surface. P. J. McCarthy was mine 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 acquired by the Little Long Lac Gold Mines Limited interests. The directors and officers were: R. C. Stanley Jr., president and director; J. G. Boeckh, vice-president and director; J. C. Adamson, J. C. L. Allen, P. K. Hanley, and S. J. Bird, directors; Miss B. A. Argo, secretary-treasurer. The head office is at 199 Bay Street, Toronto. The mine address is Geraldton.

The property comprising 24 claims is in Ashmore and Errington townships, District of Thunder Bay.

Mining and milling continued throughout 1960.

SHAFTS, MACLEOD-COCKSHUTT MINE

	Claim No.	Inclination	Number of Compartments	Total Depth from Surface
				feet
No. 1 shaft	T.B.10040	Vertical	3	2,250
No. 2 shaft	T.B.10038	Vertical	4	1,921
No. 3 winze (below 11th level, inactive)	——	45°	4	2,015

Development work during the year consisted of 1,116 feet of drifting, 678 feet of crosscutting, and 34 feet of raising. Total development footage to 31 December 1960 was as follows: 104,509 feet of drifts; 28,647 feet of crosscuts; 34,366 feet of raises. Diamond-drilling in 1960 consisted of four holes, totalling 734 feet, from underground.

New equipment added in 1960 included the following:

1 primary reversing panel and a secondary panel (Canadian Westinghouse).
1 tractor (Allis-Chalmers H.D.6, Northwestern Tractor & Equipment).
1 tractor and loader (Allis-Chalmers H.D.6G, Northwestern Tractor & Equipment).
4 Holman hand-drills (Holman Bros.).
2 stopers (Canadian Ingersoll-Rand).
2 drifters (Gardner Denver).
2 Pekrose tuggers (C.A., Peacock Bros. Ltd.).

The following is taken from the general manager's report for the year ending 31 December 1960:

The F zone continues to be the source of all ore and now is almost completely developed. Recoverable reserves in stopes and pillars at the year's end were estimated to be 1,012,366 tons averaging 0.119 ounces of gold per ton.

These reserves are sufficient to provide all the mill feed for the current year. Early in 1962 it is planned to take ore from Consolidated Mosher at a rate of 1,250 tons daily, with the remaining mill feed from MacLeod-Cockshutt's reserves until they are depleted.

Connections to Consolidated Mosher workings were completed on the 12th and 13th levels. The latter will serve as a main haulage, and all Mosher ore above that horizon will be hoisted in MacLeod-Cockshutt shafts.

Operating costs during the year were as follows:

Distribution	In Full	Per Ton
Mine development	$ 49,771	$0.072
Mining	1,130,284	1.639
Milling	551,588	0.800
Mine office and supervision	86,487	0.125
General expense at property	239,820	0.348
Administration and corporate expense	51,400	0.074
Ontario royalty tax	17,560	0.026
Total	$2,126,910	$3.084

The average number of employees was 323: 132 underground, and 191 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. On 6 June 1940, the capitalization was reduced to 3,500,000 shares by the cancellation of 1,500,000 unissued shares. The number of shares issued at the end of 1960 was 3,499,528. The directors and officers were: Joseph McDonough, president and director; F. R. Marshall, vice-president and director; Marius Madsen, H. H. Mackay, H. G. Young, A. H. Seguin, and S. J. Bird, directors; Margaret Masterson, secretary-treasurer; E. G. Bishop, consultant. The head office is at 55 Yonge Street, Toronto. The mine address is Madsen.

The company's main property comprising 58 claims is in Baird and Heyson townships, Red Lake area, District of Kenora (Patricia Portion). It is about 7½ miles southwest of the Howey mine and may be reached by road from Red Lake.

Mining and milling operations continued throughout 1960.

SHAFTS, MADSEN RED LAKE GOLD MINE

	Claim No.	Inclination	Number of Compartments	Depth from Surface
				feet
No. 1 shaft[1]	K.R.L.11505	Vertical	2	573
No. 2 shaft	K.R.L.12528	Vertical	3	3,875

[1]Not being used.

Development work in 1960 consisted of 10,547 feet of drifting, 1,983 feet of crosscutting, and 2,695 feet of raising. Total development footage to 31 December 1960 was as follows: 125,142 feet of drifts; 22,568 feet of crosscuts; 50,606 feet of raises. Diamond-drilling in 1960 consisted of 337 holes, totalling 79,424 feet, from underground, and two holes, totalling 318 feet, from surface.

New equipment added included the following:

2 diesel locomotives (48 DLU, Ruston-Hornsby).
1 mine-car loader (LM 56 H, Atlas Copco).
1 mucking train (12-115 cu. ft. cars and equipment, Dorr-Oliver-Long).

The following is taken from the general manager's report for the year ending 31 December 1960:

Milling

The details of the mill operation are shown in the following summary. For comparative purposes the details of the two previous years' operation and for the total operating life of the mine are also shown.

	Year Ending			11 Aug. 1938 to 31 Dec. 1960
	31 Dec. 1958	31 Dec. 1959	31 Dec. 1960	
Ore treated ..... tons	302,200	301,999	306,377	4,909,795
Operating time of total time ..... percent	97.64	97.42	98.04	95.90
Ore treated per calendar day ..... tons	827.9	827.4	837.09	600.3
Average gold assay heads ..... oz.	0.4310	0.4190	0.4092	0.3072
Average gold assay tails ..... oz.	0.0224	0.0256	0.02505	0.01793
Recovery ..... percent	94.81	93.90	93.95	94.16

The tonnage of ore treated during the year was the highest in any year since production was commenced.

Operating Costs

Distribution	1960			1959		
	In Full	Cost per Ton Milled	Cost per Ounce Produced	In Full	Cost per Ton Milled	Cost per Ounce Produced
Development and exploration	$743,992.35			$662,828.46		
Less portion deferred	93,125.08			126,957.06		
	$650,867.27	$ 2.124	$ 5.465	$535,871.40	$1.774	$ 4.511
Stope preparation	$ 102,666.79	0.335	0.862	$ 102,167.47	0.338	0.860
Stoping	976,311.43	3.187	8.199	995,917.01	3.298	8.383
Mucking, tramming, and hoisting	571,027.21	1.864	4.796	452,334.80	1.498	3.807
Crushing and conveying	99,121.69	0.324	0.832	84,915.93	0.281	0.715
Milling	373,202.41	1.218	3.134	361,734.44	1.198	3.045
Mine general expense	339,724.13	1.109	2.852	320,615.10	1.062	2.699
Head office expense	66,310.53	0.216	0.557	63,034.80	0.209	0.530
Marketing charges	31,169.20	0.102	0.262	26,989.67	0.089	0.227
Total	$3,210,400.66	$10.479	$26.959	$2,943,580.62	$9.747	$24.777
Deduct estimate of emergency assistance	140,000.00	0.457	1.176	——	——	——
Net Total	$3,070,400.66	$10.022	$25.783	$2,943,580.62	$9.747	$24.777

Production

	1960	1959
Milled.....tons	306,377	301,999
Gold produced.....oz.	119,083.749	118,804.674

Ore Reserve

Source	31 December 1960			31 December 1959		
	Tonnage	Ounces	Grade	Tonnage	Ounces	Grade
7th level to surface.....	22,990	6,189	0.269	28,930	9,112	0.315
11th level to 7th level.....	52,160	15,205	0.291	57,200	16,777	0.293
17th level to 11th level....	271,630	85,897	0.316	366,340	122,475	0.334
From 50 feet below 20th level to 17th level.....	206,000	80,898	0.393	46,700	18,370	0.393
Broken reserve.....	98,150	26,664	0.290	104,980	32,544	0.310
Total.....	650,930	214,853	0.330	604,150	199,278	0.330

All high assays were reduced to 1.00 ounce, and a dilution factor of 10 percent was allowed in the calculation of grade and tonnage of the ore reserve.

The average number of employees was 411: 288 underground, and 123 on surface. 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, J. Y. Murdoch, H. L. Roscoe, and W. S. Row, directors; C. H. Windeler, secretary; R. G. Rudolf, treasurer. The executive office is at 1700 Bank of Nova Scotia Building, Toronto. The head office and mine office are at Pamour.

The company's main property, totalling 33 claims, is in Whitney and Murphy townships, Porcupine area, District of Cochrane. It includes the former LaPalme Porcupine, Three Nations, and Porcupine Grande properties.

Mining and milling continued throughout 1960.

SHAFTS, PAMOUR MINE

	Claim No.	Inclination	Number of Compartments	Total Depth from Surface
				feet
No. 1 shaft (inactive).....	P.13793	Vertical	2	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 4,203 feet of drifting, 1,156 feet of crosscutting, and 544 feet of raising. Total development footage to 31 December 1960 was as follows: 154,127 feet of drifts; 33,443 feet of crosscuts; 78,471 feet of raises. Diamond-drilling in 1960 consisted of 312 holes, totalling 57,310 feet, from underground.

New equipment installed included a pump motor on the 1,000-foot level (2,300-volt, 1,500 rpm., Mather and Platt); a crusher on 2,900-foot level (36 x 48 ft., 160-tph., Allis-Chalmers); a raise machine (Joy Mfg. Co.).

The following is taken from the manager's report for the year ending 31 December 1960:

Stoping

Stoping was carried on in both the east and west sections of the mine. Some 19 percent of the ore produced was from lava stopes. The east end provided 59 percent of the tonnage broken and 69 percent of the tonnage milled.

Cut-and-fill stopes provided 7 percent of the ore broken, slusher stopes 16 percent, blast-hole stopes 6 percent, and shrinkage stopes the remainder.

Ore Reserves

Ore	Total	Grade
	tons	ounces per ton
BROKEN		
East end	624,484	0.087
West end	207,550	0.106
Total Broken Ore	832,034	0.092
ORE IN PLACE		
East end	465,692	0.103
West end	339,803	0.129
Total Ore in Place	805,495	0.115
Total east-end ore	1,090,176	0.094
Total west-end ore	547,353	0.121
Total	1,637,529	0.103

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

After milling 646,118 tons, total ore reserves were increased by 29,161 tons with a slight decrease in grade. Broken-ore reserves were increased by 129,221 tons.

Milling

The average daily tonnage was 1,770 tons, and the average grade of ore milled was 0.108 ounces of gold per ton. Average recovery was 89.8 percent.

The average number of employees was 371: 211 underground, and 160 on surface. F. E. Patton was manager, and was replaced by W. J. Marshall at the end of the year.

Pantan Mines Limited

Pantan Mines Limited was incorporated in February 1951, with an authorized capitalization of 3,000,000 shares of $1 par value, of which 2,608,653 have been issued. The officers and directors are: J. N. Plexman, president and director; F. J. Ainsborough, secretary-treasurer and director; Jack Haynes, Blanchard Ariko, and W. R. Carson, directors. The head office address is 73 Adelaide Street West, Toronto. The mine address is Dyment.

Pantan Mines Limited leased from Tabor Lake Gold Mines Limited the property consisting of 15 claims, formerly called Clark Gold Mines, located immediately south of the south boundary of Melgund township, District of Kenora.

Previous work on the property included the sinking of a three-compartment, vertical shaft to a depth of 280 feet, on claim K.912.

There was no development work completed in 1960. Total development footage at 31 December 1960 was as follows: 327 feet of drifts; 330 feet of crosscuts.

A small amalgamation mill capable of handling about 15 tons daily was constructed to test a stockpile of ore left by previous operators. New construction included a mill building (52 x 28 ft.); an inclined conveyor housing (60 x 6 x 8 ft.); a diesel-electric power-house (30 x 40 ft.).

Equipment installed included a primary crusher, ore conveyors, 15-ton combination ball mill and classifier, 50-ton amalgamator, retort, water pump, lighting unit, and diesel power unit and accessories.

The contractor supplied an average of four employees. J. N. Plexman, president, was in charge of operations at the property.

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: C. E. Cook, president and managing director; W. C. Ringsleben, vice-president and director; H. D. Rothwell, 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.

The main property, comprising 751.6 acres in Deloro and Tisdale townships, Porcupine area, District of Cochrane, consists of amalgamated holdings of former operating companies.

Mining and milling continued throughout 1960.

SHAFTS, PAYMASTER CONSOLIDATED MINE

	Claim No.	Inclination	Number of Compartments	Total Depth from Surface
				feet
No. 1 shaft (inactive)	T.R.S.776	Vertical	2	80
No. 2 shaft (inactive)	T.R.S.776	Vertical	2	814
No. 3 shaft (inactive)	T.R.S.776	Vertical	4	400
No. 4 shaft (inactive)	H.S.747	Vertical	2	253
No. 5 shaft	P.14115	Vertical	3	4,316
No. 5 winze (below 2,075-foot level)	——	Vertical	3	4,212
No. 6 winze (below 4,075-foot level)	——	Vertical	3	4,501
No. 1050-1 winze (below 1,050-foot level) (inactive)	——	75°	2	1,212
No. 1050-2 winze (below 1,050-foot level) (inactive)	——	Vertical	2	1,632
No. 1050-3 winze (below 1,050-foot level) (inactive)	——	Vertical	2	2,120
No. 6 shaft (inactive)	P.13128	60°	2	482
No. 400-4 winze (below 400-foot level) (inactive)	——	Vertical	2	1,080
No. 7 shaft (inactive)	P.14114	Vertical	filled	75
No. 8 shaft (inactive)	P.14115	Vertical	filled	185
No. 9 shaft (ventilation)	P.14115	Vertical	1	185

Development work during the year consisted of 4,043 feet of drifting, 630 feet of crosscutting, and 3,026 feet of raising. Total development footage to 31 December 1960, was as follows: 179,279 feet of drifts; 78,018 feet of crosscuts; 58,184 feet of raises. Diamond-drilling in 1960 consisted of 306 holes, from underground, totalling 26,305 feet.

The company's fiscal year ends 30 June 1961. Excerpts from the general manager's report will appear in the annual report for that year.

The average number of employees was 279: 195 underground, and 84 on surface. L. K. Walkom was general manager.

Pick Mines Limited

The company has acquired the Cline and Pick groups of 16 claims, comprising 693 acres in Township 48, District of Algoma, about 12 miles east of Goudreau. The property, a gold-silver prospect, was operated from 1938 to 1942 as Cline Lake Gold Mines Limited.

The head office address of Pick Mines Limited is 80 King Street West, Toronto. The mine is at Goudreau.

The company acquired buildings and equipment from Jardun Mines Limited and is moving these to the Pick property. The erection of a hoistroom and compressor house, boiler house, power house, office, bunkhouse, and cookery had been completed. The mining equipment, including hoist and headframe, the surface plant, and mill equipment for a 50-ton mill had been purchased. In addition, during 1960 about 800 feet of surface trenching, averaging 3–5 feet in depth, was completed. Five diamond-drill holes, totalling 992 feet, were completed from surface.

An average of nine men was employed. M. C. Halstead was engineer in charge.

Pickle Crow Gold Mines Limited

Pickle Crow Gold Mines Limited was incorporated in January 1934, with an authorized capitalization of 3,500,000 shares of $1 par value. In April 1959 the capitalization was increased to 5,000,000 shares, of which 3,553,780 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 W. A. Robinson, directors; J. M. Bland, treasurer. The head office is at 11 Adelaide Street West, Toronto. The mine office is at Pickle Crow.

The property consists of 96 claims in Connell and McCullagh townships, Pickle Lake area, District of Kenora (Patricia Portion).

Mining and milling continued throughout 1960.

SHAFTS, PICKLE CROW MINE

	Claim No.	Number of Compartments	Total Depth from Surface
			feet
No. 1 main shaft (Howell vein)	P.A.747	3 to 1,200 ft. 4 to 2,450 ft. 3 to bottom	3,042
No. 2 winze (below 750-ft level; inactive)	——	3	1,547
No. 3 shaft (5,000 ft. NE. of No. 1)	P.A.2062	3 to 1,554 ft. 4 to 2,600 ft. 3 to bottom	3,031

Development work during the year consisted of 4,192 feet of drifting, 935 feet of crosscutting, and 2,554 feet of raising. Total development footage to 31 December 1960 was as follows: 65,194 feet of drifts; 49,762 feet of crosscuts; 38,185 feet of raises. Diamond-drilling in 1960 included 133 holes, totalling 26,916 feet, from underground.

The following is taken from the mine manager's report for the year ending 31 December 1960:

Stoping

Some 120,460 tons of ore were hoisted to the crushing plant, of which 102,036 or 84.7 percent came from stopes. The remainder came from development headings.

The distribution of the ore hoisted by shafts and veins was as follows:

	Tons	Percent
No. 1 Shaft		
No. 1 vein	8,987	8.81
No. 5 vein	19,737	19.34
No. 9 vein	4,615	4.52
No. 3 Shaft		
No. 2 vein	38,908	38.14
No. 6 vein	23,114	22.65
No. 7 vein	2,006	1.97
No. 8 vein	4,669	4.57

Some 13,429 tons of backfill were placed in stopes.

Milling

Ore milled	tons	120,345
Gold recovered	oz.	39,663
Gold recovered per ton	oz.	0.3296
Recovery	percent	98.74

Costs

Distribution	In Full	Per Ton	Per Ounce
Development	$ 245,017	$ 2.036	$ 6.177
Mining	930,834	7.734	23.468
Milling	218,581	1.816	5.511
General mine expenses	189,151	1.571	4.768
Depreciation	58,359	0.484	1.471
Total Costs	$1,641,842	$13.641	$41.395

Ore Reserves

		1 Jan. 1961	1 Jan. 1960
Total ore reserves	tons	407,803	473,206
Grade	per ton	$13.01	$13.07

All values recorded are based on gold at $35.00 per ounce.

The average number of employees was 250: 155 underground and 95 on surface. A. E. Cave was manager.

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 3,533,360 shares have been issued. The directors and officers were: D. F. Hurd, president and managing director; T. R. Rowe, vice-president and director; J. V. Driscoll and E. F. Carr, directors; J. R. McDougall, secretary-treasurer. The head office and mine address is 82 Government Road West, Kirkland Lake.

The property, formerly known as Melba Gold Mines, consists of 16 claims located in Melba township, District of Timiskaming, about 12 miles north of

Kirkland Lake. The two-compartment shaft, located on claim L.59506, and inclined at 55 degrees, had been sunk a distance of 246 feet, with a level at 225 feet vertical depth on which 982 feet of drifting and 127 feet of crosscutting had been completed.

Development work in 1960 included some 600 feet of trenching, averaging 5 feet in depth. A total of 32 diamond-drill holes, totalling 2,500 feet, was completed from underground.

D. F. Hurd, president and managing director, was in charge. The average number of men employed was three.

Preston Mines Limited

Preston East Dome Mines Limited was incorporated in January 1911, and reorganized by supplementary letters patent in February 1936. In September 1957, the company was again reorganized, and the capitalization was increased from 3,000,000 shares of $1 par value to 7,000,000 shares of $1 par value. In August 1960, the name was changed to Preston Mines Limited on the amalgamation of Preston East Dome Mines Limited with Stanleigh Uranium Mining Corporation Limited. The capitalization was increased to 5,000,000 preference shares of $0.50 par value, of which 3,930,075 have been issued, and 10,000,000 common shares of no par value of which 6,728,000 have been issued. The company is controlled by Rio Tinto Mining Company of Canada Limited. The directors and officers were: W. H. Bouck, president and director; W. B. Malone, vice-president and director: Hon. R. H. Winters, chairman and director; J. I. Crookston, J. H. Hirshhorn, G. B. Langford, W. C. Pitfield, and W. P. Arnold, directors; R. D. Lord, managing director; George Baker, secretary; D. A. Macfarlane, treasurer. The head office is at 335 Bay Street, Toronto. The mine office is at South Porcupine.

The property, comprising 18 claims immediately south and east of the Dome mine, is located in Tisdale and Deloro townships, Porcupine area, District of Cochrane. Early in 1959 the company acquired the property of Midcamp Mines Limited, consisting of 355 acres, adjoining the Paymaster and Preston East Dome mines.

Mining and milling operations continued throughout 1960.

SHAFTS, PRESTON MINE

	Claim No.	Inclination	Number of Compartments	Total Depth from Surface
				feet
No. 1 shaft (escape)	P.13151	63°	2	95
No. 2 shaft	P.13151	Vertical	5	2,388
No. 3 internal shaft (below 18th level)	——	Vertical	3 to 69 ft. above 28th level 4 to bottom	4,170
No. 4 shaft (inactive)	P.12971	Vertical	3	400

Development work during the year consisted of 2,771 feet of drifting, 5,652 feet of crosscutting, and 2,838 feet of raising. The total development footage figures have been increased to include the work completed on the Midcamp property prior to 1959. The totals at 31 December 1960 were as follows: 116,499 feet of drifts; 151,252 feet of crosscuts; 58,747 feet of raises. Diamond-drilling in 1960 consisted of 611 holes, totalling 78,053 feet, from underground.

New equipment included an Alimak raise machine (Mine Equipment Co.) and natural-gas-fired boilers (Dominion Bridge Co. Ltd.).

The following is taken from the mine manager's report for the year ending 31 December 1960:

Operating Costs

Operating costs per ton milled at the mine, before charging administration expense, depreciation, taxes, and write-offs, were as follows:

	Per Ton
Development and diamond-drilling	$1.96
Mining	5.46
Milling	1.19
	$8.61

Ore Reserves

The mine produced 226,907 tons of ore during the year, of which 10 percent came from development. At the year's end, the broken-ore reserve stood at 47,370 tons, an increase of 12,940 tons.

Ore reserves at 31 December 1960 totalled 567,805 tons with an estimated grade of 0.23 ounces per ton. Of this figure, 251,400 tons have been indicated from development to date in the Midcamp zone.

General

The mill performed well throughout the year and produced an average recovery of 97.7 percent. Capital expenditures totalled $33,000 for the year and covered automatic gas-fired heating boilers, one raise-climbing machine, and extensions to the hydraulic-fill installation, as the principal items. The use of hydraulic fill contributed largely to the stabilization of operating costs, and plans are underway to extend the facilities to the Midcamp stopes. The purchase cost of the two new 75-horsepower heating boilers is expected to be saved within two years.

The average number of employees was 331: 235 underground, and 96 on surface. G. F. Greenacre was 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 are: R. A. Bryce, president and director; Larmour Soliague, assistant to the president, and director; J. D. Bryce, executive vice-president and director; G. A. Howes, J. C. L. Allen, J. G. Boeckh, and C. C. Huston, directors; H. W. Salthouse, secretary-treasurer. The head office is at 85 Richmond Street West, Toronto. The mine address is Renabie.

The property comprising 33 claims is located in Rennie and Leeson townships, District of Sudbury.

Mining and milling continued throughout 1960.

SHAFTS, RENABIE MINE

	Claim No.	Inclination	Number of Compartments	Total Depth from Surface
				feet
No. 1 shaft	S.34314 (Leeson tp.)	Vertical	3	281
No. 2 shaft	S.34317 (Leeson tp.)	Vertical	3	2,229

Development work during the year consisted of 2,559 feet of drifting, 1,796 feet of crosscutting, and 2,185 feet of raising. Total development footage to 31 December 1960 was as follows: 27,093 feet of drifts; 13,388 feet of crosscuts;

17,866 feet of raises. Diamond-drilling in 1960 consisted of 129 holes, totalling 22,841 feet from underground and 6 holes, totalling 5,234 feet, from surface.

New construction included a boiler-house extension (10 x 21.5 ft.) and a shavings storage bin (40 x 18 x 32.7 ft.).

The following is taken from the mine manager's report for the year ending 31 December 1960:

Milling

The average tons milled per day in 1960 was 490.5, as compared with 536.7 in 1959. The extraction for the year was 94.9 percent.

The over-all milling costs for the year increased to $1.73 per ton from $1.66 per ton in 1959, owing to the lower tonnage milled in 1960. The recovery improved to 94.9 percent as compared with 93.2 percent in 1959.

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 1,700-foot level, was as follows:

Source	Ore	Grade	Value (gold at $35 per ounce)
	tons	oz. per ton	
Unbroken ore	250,915	0.208	$7.28
Broken ore	67,389	0.208	7.28
Total	318,304	0.208	$7.28

Costs

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

Distribution	1960		1959	
	38,911.290 ounces recovered from 179,520 tons milled		36,349.96 ounces recovered from 195,898 tons milled	
	per ton	per ounce	per ton	per ounce
Development and exploration	$1.88	$ 8.69	$1.20	$ 6.47
Mining	3.08	14.20	2.89	15.56
Milling	1.73	7.97	1.66	8.96
Undistributed operating charges, including administration and head office	0.56	2.60	0.38	2.06
Operating costs	7.25	33.46	6.13	33.05
Depreciation	0.55	2.53	0.51	2.74
Provision for municipal, federal, and provincial taxes	0.04	0.18	0.03	0.16
Total Costs	$7.84	$36.17	$6.67	$35.95

The average number of employees was 191: 85 underground, and 106 on surface. W. A. Moore was mine manager.

Sylvanite Gold Mines Limited

Sylvanite Gold Mines Limited was incorporated in June 1913, with an authorized capitalization of 3,300,000 shares of $1 par value, of which 3,299,500 have been issued. The directors and officers were: W. V. Moot, president and managing director; K. C. Gray, vice-president, general manager, and director; Whitworth Ferguson, vice-president and director; W. S. Walton, secretary-

treasurer and director; F. R. Burton, L. R. Gulick and A. F. Osborn, directors. The executive office is at Erie County Bank Building, Buffalo, N.Y. The head office and mine office address is Box 670, Kirkland Lake.

The main property comprising five and a fraction claims is in Teck township, Kirkland Lake area, District of Timiskaming.

Mining and milling continued throughout 1960.

SHAFTS, SYLVANITE MINE

	Claim No.	Number of Compartments	Total Depth from Surface
			feet
No. 1 shaft (inactive)	L.2226	2	125
No. 2 shaft	L.2100	3	3,642
No. 3 shaft (inactive)	L.2227	2	118
No. 4 shaft	L.2101	2	1,762
No. 5 winze (below 3,150-foot level)	——	4	5,605

During the year a total of 1,777 feet of drifting, 374 feet of crosscutting, and 2,472 feet of raising was completed. Total development footage to 31 December 1960 was as follows: 233,104 feet of drifts; 70,648 feet of crosscuts; 74,567 feet of raises. Some 81 diamond-drill holes, totalling 5,906 feet, were completed from underground during 1960.

The following is taken from the report of the vice-president and general manager for the year ending 31 December 1960:

General

The average daily tonnage milled decreased by 37.8 tons as compared with the previous year, and the recovery dropped to 0.24 ounce per ton. The drop in tonnage milled was due mainly to a break in the main gear on the ball mill. This break occurred on 21 January, and until repaired on 1 April the maximum tonnage milled was reduced to 300 tons daily.

The broken-ore reserves increased by 10,424 tons to 45,671 tons during 1960. The ore remaining to be broken is mainly in small blocks. It is estimated that the mill can be kept running until about the middle of 1961.

The average price received for an ounce of gold increased to $34.04, from $33.57 in 1959.

Broken-ore Reserves

Broken-ore reserves were 45,671 tons at the end of the period, an increase of 10,424 tons for the year.

Operating Costs

Operating costs per ton milled were 96.9 cents higher than last year.

Distribution	In Full	Per Ton Ore Milled	Per Ounce Gold Produced
Development and exploration	$ 178,399	$1.092	$ 3.853
Mining	910,220	5.572	19.661
Milling, including tailings disposal	268,015	1.641	5.789
General charges (after deducting sundry revenue)	79,555	0.487	1.718
Administration expense	58,686	0.359	1.268
Bullion-selling expense:			
Insurance, shipping, and mint refining charges	2,886	0.017	0.062
Mint handling charges	9,259	0.057	0.200
Total	$1,507,020	$9.225	$32.551

Mining

Summary of ore and waste broken:

Year	Ore Broken in Stopes	Ore From Development	Total Ore Broken	Waste Broken and Used for Backfill	Total Ore and Waste Broken
	tons	tons	tons	tons	tons
1958	133,657	12,375	146,032	10,097	156,129
1959	126,727	7,872	134,599	7,198	141,797
1960	133,853	9,232	143,085	8,380	151,465

The average number of employees was 266: 178 underground, and 88 on surface. W. S. Maguire was general superintendent.

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 4,842,144 have been issued. The officers and directors are: N. B. Keevil, chairman of the board; J. C. Perry, president and director; R. M. Butler, secretary and director; J. W. Stephenson, treasurer and director; W. H. Keith, R. E. Metz, 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.

The main property, comprising 33 claims, is located in Teck township, Kirkland Lake area, District of Timiskaming.

Mining and milling continued throughout 1960.

SHAFTS, TECK-HUGHES MINE

	Claim No.	Inclination	Number of Compartments	Total Depth from Surface
				feet
South shaft	16625	Vertical	4	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

Hoisting operations have been discontinued in the south shaft extension between the 32nd and 36th 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, 1,084 feet of drifting, 934 feet of crosscutting, and 1,320 feet of raising was completed. Total development footage to the end of the year was as follows: 141,197 feet of drifts; 55,063 feet of crosscuts; 86,740 feet of raises. Some 81 diamond-drill holes, totalling 2,347 feet, were completed during 1960 from underground.

The following is taken from the manager's report for the year ending 30 September 1960:

Operating Costs

A comparison of operating costs for the nine-month period ended 30 September follows. Increases in total costs include approximately $11,000 additional assessment for silicosis and accident insurance, and $27,000 for increased payroll.

Distribution	In Full		Per Ton of Ore Treated		Per Ounce of Gold Produced	
	1960	1959	1960	1959	1960	1959
Development	$ 87,468.96	$ 89,907.05	$0.61	$0.65	$ 4.246	$ 4.876
Mining	494,295.29	449,192.77	3.46	3.28	23.995	24.361
Milling	202,626.10	196,996.83	1.42	1.44	9.836	10.683
General expense	63,736.72	59,939.98	0.44	0.44	3.094	3.251
Depreciation	197.28	281.88	——	——	0.010	0.015
Total	$848,324.35	$796,318.51	$5.93	$5.81	$41.181	$43.186

Mining

The sources of ore milled during the first nine months of each year are shown below:

Source	Total		Gold Content		Average Grade	
	1960	1959	1960	1959	1960	1959
	tons	tons	ounces	ounces	dwt. per ton	dwt. per ton
Surface stockpile	——	——	——	——	——	——
Levels 0–10	——	——	——	——	——	——
Levels 10–20	52,591	38,280	11,420.5	6,587.6	4.34	3.44
Levels 20–30	73,561	74,450	8,591.7	8,451.1	2.34	2.27
Levels 30–40	16,873	24,250	3,941.6	4,461.4	4.67	3.68
Total	143,025	136,980	23,953.8	19,500.1	3.35	2.85

The amount of ore obtained from branch veins in the hanging wall declined to only 0.46 percent of the tonnage milled and 0.52 percent of the gold content. Corresponding figures for the first nine months of 1959 were 2.3 percent and 5.1 percent, respectively.

Operating results for the past five years, and for nine months of 1960, are shown in the following table.

Year	Milled	Average Grade	Value of Bullion Production[1]	Investment Income	Operating Costs	Profit
	tons per day	dwt. per ton	per ton	per ton	per ton	per ton
1955	616	3.22	$5.89	$0.35	$5.45	$0.79
1956	537	3.45	6.32	0.35	5.93	0.74
1957	498	2.97	5.79	0.43	6.00	0.22
1958	542	2.80	5.60	0.37	5.48	0.49
1959	505	2.89	5.81	0.23	5.83	0.21
1960[2]	522	3.35	6.33	0.25	5.93	0.65

[1]Including Emergency Gold Mining Assistance.
[2]Nine months only.

Expensive recovery work and development in the vicinity of the south shaft extension between the 33rd and 36th levels were completed to the extent that mining could be resumed in one stope and started in two others. One or two additional stopes in this area will be started soon.

Mining in the rest of the mine was confined to scattered pillars and remnants with the exception of the 19th level, where a new stope was started on the branch vein referred to elsewhere. As in recent years the bulk of production has come from slough and caving of low-grade hanging wall, in some cases accelerated or augmented by long-hole blasts.

Ore Reserves

Ore reserves at 30 September 1960 compare as follows:

Source	Quantities of Ore		Gold Content		Average Grade	
	1960	1959	1960	1959	1960	1959
	tons	tons	ounces	ounces	dwt. per ton	dwt. per ton
POSITIVE ORE						
Blocked	60,001	62,899	21,524.0	23,614.5	7.17	7.51
Broken	43,802	41,951	8,700.1	8,358.8	3.97	3.99
Totals	103,803	104,850	30,224.1	31,973.3	5.82	6.10
POTENTIAL ORE						
Blocked	7,778	8,058	3,609.7	3,682.5	9.28	9.14
Broken	9,830	10,830	3,966.6	4,116.6	8.07	7.60
Totals	17,608	18,888	7,576.3	7,799.1	8.61	8.26
TOTAL	121,411	123,738	37,800.4	39,772.4	6.23	6.43

As before, the term "potential" is applied to proven ore that may or may not be recovered owing to adverse mining conditions in old workings. If and when recovery becomes feasible, such ore is transferred to positive ore.

The average number of employees was 191: 120 underground, and 71 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 par value of which 1,597,454 shares have been issued. The directors and officers were: F. C. Krischan, president and director; F. Prudhomme, vice-president and director; J. H. Thompson, director; R. W. Davies, secretary; C. E. Upton, treasurer. The head office is at 320 Bay Street, Toronto. The mine address is P.O. Box 11, Schumacher.

The property consists of 24 claims in Garrison township, District of Cochrane; it was formerly called Buffonta Mines Limited.

Operations progressed from 5 August to 15 November 1960.

During the period of operation seven diamond-drill holes, totalling 1,998 feet, were completed from surface.

C. W. Miller was manager.

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; T. J. Day, president and director; J. W. McBean, vice-president and managing director; J. H. Botsford, director and general manager; Jenkin Evans, E. T. Donaldson, and J. A. Dickson, directors; K. H. Larkin, secretary-treasurer. The head office is at 250 University Avenue, Toronto. The mine address is Dobie.

The company's property, consisting of 47 claims, is in Gauthier township, Kirkland Lake area, District of Timiskaming.

Mining and milling continued throughout 1960.

SHAFTS, UPPER CANADA MINE

	Claim No.	Inclination	Number of Compartments	Depth from Surface
				feet
No. 1 shaft	L.6314	Vertical	3 to 1,750-ft. level. 4 to 3,625-ft. level. 3 to bottom	4,965
No. 2 shaft	L.6321	Vertical	3	1,877

No. 1 shaft was sunk 425 feet in 1960 to a total depth of 4,965 feet below surface. The 4,675-, 4,800-, and 4,950-foot levels were established.

During the year, 4,203 feet of drifting, 892 feet of crosscutting, and 1,420 feet of raising was completed. Total development footage to 31 December 1960 was as follows: 127,040 feet of drifts; 30,678 feet of crosscuts; 31,061 feet of raises.

Some 525 diamond-drill holes, totalling 48,796 feet, were drilled from underground, and four holes, totalling 2,854 feet, from surface.

The following is taken from the general manager's report for the year ending 31 December 1960:

Construction

Capital expenditure on construction totalled $381,571.86 of which the largest item was the No. 1 shaft hoisting plant.

A 10-foot double-drum hoist was installed in a new hoistroom of fireproof construction. The building also accommodates the existing compressor plant, including a newly installed aftercooler, and will provide room for additional equipment when needed. Mining operations in the shaft were suspended for four weeks to permit the headframe change-over. The new surface hoist will handle everything down to the 3,625-foot level. The ore below this will be hoisted by an underground hoist located on the 3,625-foot level. This hoist will have an ultimate depth capacity of 6,000 feet below surface. The 6-foot hoist replaced on surface has been equipped with split drums and an alloy-steel shaft, and is at present being installed in the newly completed underground hoistroom. Work is also proceeding on the loading-pockets, dumps, and sheaves for this underground installation, which is scheduled for completion early this summer.

In addition, the crusher-house was enlarged to provide a 26-foot extension to the coarse-ore bin, the overhead power lines from the transformers to the hoistroom were replaced in an underground cable trench, and warehouse, bit shop, and warm-room facilities have been provided in the new shaft-house.

Following the completion of the major part of the surface program, a 91- by 32-foot extension was added to the east side of the mill building to house three additional agitators.

Mill feed during the construction shut-down period came from No. 2 shaft, largely from broken-ore reserves, which had been accumulated for this purpose.

Enough new ore was developed in No. 2 shaft to keep the shaft operating a few months longer than expected. This will be of assistance in maintaining ore production during periods when hoisting at No. 1 shaft is affected by the winze hoist construction program.

Milling

Average tons per day was 568.1, recovery was 91.4 percent, and total tailings loss was $0.86. The mill operated 98.6 percent of total possible running time.

The probability of improving extraction of flotation followed by fine grinding or roasting was thoroughly explored, and the research program indicated that the present straight cyanide circuit is still the most suitable for our present ore; this work also showed the extraction could be improved by longer agitation. Three 24- by 24-foot agitators were then purchased and installed in the mill circuit in February of the current year. Results to date show an increase in recovery varying from 12 to 22 cents per ton—at this rate the capital cost of the new equipment will be returned in less than two years.

General

The two new levels established this year give a total of eight levels, or 1,200-feet of ground below the 3,625-foot level. The ore at present developed above the 3,625-foot level gives ample time for development and stope preparation of the very promising section below.

Efficiencies in operation gained from the new mine plant will help to offset the effect of rising wages, hydro-electric power rates, and higher cost of mining in the deeper levels.

Operating Costs and Profits

Cost per ounce of fine gold produced, before depreciation, taxes, etc., was $32.140. Operating costs per ton milled over the past four years are tabulated below:

	1960	1959	1958	1957
Mine exploration and development	$1.41	$1.53	$1.24	$1.48
Mining	4.71	5.02	4.85	4.75
Milling	1.25	1.26	1.27	1.30
General expense	0.96	0.99	0.94	0.93
Total	$8.33	$8.80	$8.30	$8.46

A reduction in the amount of development work and the drawing down of broken-ore reserves, especially during the construction period, resulted in the drop in operating costs of 47 cents per ton.

Although mill heads of $10.06 at $35.00 gold were about the same as in the previous year, the lower cost per ton, an increase in the price received for gold from $33.536 to $34.001, and the greater number of tons milled, increased mine operating profit by $99,627.38 to $388,467.00.

Because of heavier write-offs resulting from construction and shaft-sinking, net profit for the year at $121,132.34 is down from $132,859.98 in 1959.

The average number of employees was 273: 169 underground, and 104 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 of which have been issued. The officers and directors are: R. C. Stanley Jr., president and director; J. G. Boeckh, executive vice-president, treasurer, and director; J. C. L. Allen, S. J. Bird, M. W. Hotchkin, E. Merkle, and N. O. Seagram, directors; Miss B. A. Argo, secretary. The head office is at 199 Bay Street, Toronto. 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 1960.

SHAFTS, WRIGHT-HARGREAVES MINE

	Claim No.	Inclination	Number of Compartments	Total Depth from Surface
				feet
No. 1 shaft (ventilation)	L.1829	Vertical	2 to 200 ft. 3 to bottom	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	8,358

During the year a total of 2,510 feet of drifting, 812 feet of crosscutting, and 1,367 feet of raising was completed. Total development footage to 31 December 1960 was as follows: 256,555 feet of drifts; 91,704 feet of crosscuts; and 77,984 feet of raises.

Some 48 diamond-drill holes, totalling 11,504 feet, were drilled from underground, and 8 holes, totalling 4,210 feet, from underground, carried out under Wright-Hargreaves–Sylvanite agreement.

The following is taken from the general manager's report for the period ending 31 December 1960:

Mining

Stopes were worked on 39 of the 51 main levels down to the 7,200-foot level, and on all six of the new levels below the 7,200-foot level.

Of the total ore milled, 29,794 tons or 18.1 percent of the total (14.5 percent in 1959) was obtained from development and mining on the six new levels opened from No. 6 winze, and the higher than average gold content of this ore helped materially to compensate for low-grade material mined on some of the upper levels.

The average gold content of ore milled in 1960 was 0.394 ounce per ton, compared with 0.421 in 1959 and 0.393 in 1958.

The broken-ore reserve was reduced by 17,998 tons to a total of 45,523 tons at the end of the year.

Origin of ore hoisted in 1960 was as follows:

Source	From Stopes	From Development	Hoisting Stages
	tons	tons	
Surface to 3,900-foot level	83,431	1,910	1
4,050- to 7,200-foot level	49,420	430	2
7,350- to 8,100-foot level	20,151	9,643	3
Total	153,002	11,983	——

Milling

Ore mined in the Wright-Hargreaves mine continued to be treated in the Lake Shore mill under a joint milling agreement.

The average daily milling rate was 450.8 tons, compared with 466.4 tons in 1959, and gold recovery was 96.3 percent of contained gold compared to 96.4 percent.

	1960	1959
Milled.....tons	164,985	170,220
Gold recovered.....oz.	62,634.911	69,000.996

Ore Reserves

After milling 164,985 tons of ore in the year, the developed available unbroken- and broken-ore reserve was reduced by 41,018 tons to a total, on 1 January 1961, of 255,453 tons containing 0.410 ounce of gold per ton.

The total reserve, including probable ore and that at present unavailable for mining, stood at 343,713 tons averaging 0.398 ounce per ton, at the end of the year.

Costs

Comparative operating costs per ton of ore milled and per ounce of gold recovered for the last two years are shown below:

COMPARISON OF OPERATING COSTS

	1960		1959	
	Per Ton Milled	Per Ounce Recovered	Per Ton Milled	Per Ounce Recovered
Mine development	$ 1.16	$ 3.05	$ 1.30	$ 3.21
Mining	7.75	19.95	7.35	18.14
Milling	1.63	4.30	1.68	4.14
General expenses at property	1.72	4.53	1.81	4.46
Mine office and supervision	0.76	1.99	0.87	2.15
Marketing expense	0.11	0.29	0.11	0.28
Administration and corporate expense	0.45	1.18	0.52	1.28
Mining taxes	0.12	0.32	0.12	0.29
Total	$13.52	$35.61	$13.76	$33.95

The average number of employees was 406: 291 underground, and 115 on surface. Frank Buckle was general manager.

IRON ORE AND IRON

Ore production decreased 11.52 percent in quantity and 4.78 percent in value from 1959. About 85 percent of the production was shipped to plants in the United States, in the pattern of previous years.

The industry paid $3,169,413 to 414 salaried employees, and $13,033,614 to 2,359 wage-earners; it used fuel and electricity worth $3,519,546, and process supplies worth $3,904,078.

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 5,771,192 shares have been issued. The directors and officers were: D. S. Holbrook, president 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); H. G. MacAdam, 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, Victoria, Alexander, and George W. MacLeod mines, the Sir James mine located 3 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 consists of 72 claims in ranges 23 and 24, Township 29, District of Algoma. No. 4 winze, No. 5 shaft, the inclined tramway, and development footage therefrom, previously reported under the Helen mine are now recorded under the George W. MacLeod mine. Operations at the Helen mine continued throughout 1960.

SHAFTS, HELEN MINE

	Claim No.	Inclination	Number of Compartments	Total Depth from Surface
				feet
No. 1 shaft (inactive)	R.737	Vertical	3	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

During 1960 a total of 1,037 feet of drifting, 135 feet of crosscutting, and 709 feet of raising was completed. Total development footage to 31 December 1960 was as follows: 97,439 feet of drifts; 12,840 feet of crosscuts; 39,969 feet of raises. Diamond-drilling in 1960 consisted of 6 holes totalling 1,315 feet from underground.

A total of 1,160,874 tons of ore was hoisted; 687,172 tons was concentrated, producing 607,327 tons of concentrate, which was treated in the sinter plant; 484,795 tons was sintered without concentration. A total of 789,170 tons of sinter was produced.

GEORGE W. MacLEOD MINE

This property consists of 14 claims in ranges 23 and 24, Township 29, District of Algoma. Operations continued throughout 1960.

SHAFTS, GEORGE W. MACLEOD MINE

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

During 1960 a total of 8,860 feet of drifting, 2,749 feet of crosscutting, and 7,747 feet of raising was completed. Total development footage to 31 December 1960, was as follows: 38,821 feet of drifts; 13,350 feet of crosscuts; 17,237 feet of raises. Diamond-drilling in 1960 consisted of 157 holes, totalling 27,920 feet, from underground.

New construction in the sinter plant area included the following:

Extension to ore-preparation plant (161 x 52 ft., steel and traffard tile).
Extension to heavy-media separation plant (72 x 48 ft., steel and traffard tile).
Stacker conveyor system (190-ft. travel, steel).
Stockpile reclaim tunnel (489-ft., concrete).
Extension to boiler house (34 x 16 ft., steel and sheet metal).
Ropeway structure (16,400 ft. in length, steel).
Ropeway drive station C (17,500 sq. ft., steel and metal siding).
Mine-air heater house (43 x 50 ft., concrete block).

Major equipment added in 1960 included the following:

ORE PREPARATION PLANT:
2 wash screens (step-deck, 6 x 14 ft., 155 tph.).
2 dewatering screens (flat-deck, 6 x 14 ft., 45 tph.).
2 dewatering screens (flat-deck, 5 x 14 ft., 43 tph.).
2 feeders (vibrating, 30 inches by 6 ft., 86 tph.).
2 pumps (Wifley, 6-inch, 75-hp., 479 gpm.).
8 cyclones (Hanna, 10-in., 10-12 tph.).
12 drain screens (stationary, 1.5 x 3.5 ft.).
12 wash screens (vibrating, 3 x 7 ft.).
1 pump (Allen Sherman Hoff, 10-in., 2,276 gpm.).
1 pump (Allen Sherman Hoff, 6-in., 500 gpm.).
3 pumps (Duplex, 6-in., 424 gpm.).
1 pump (A.S.H., 10-in., 2,188 gpm.).
1 pump (Pettibone Mulliken, 12-in., 3,863 gpm.).
4 magnetic separators (Dings, 36 x 72 ins.).
1 filter (disc, 6-ft. diam.).
1 crusher (cone, 5½-ft.).
1 mobile mill (Wemico, 150 tph.).
1 thickener (Dorr, 35 x 10 ft.).
Conveyor equipment (S.A.C.O., 1,200 ft. long, 30 ins. wide).

SINTER-PLANT AREA:
1 boiler (Ray Scott 250, 100-hp., 15 lb. pressure).
1 tractor (Caterpillar D7.).

MACLEOD MINE:
Aerial ropeway, MacLeod mine to plant (9,100 ft. surface, 7,300 ft. underground, 500 tph.).
3 heaters (oil-fired, 4,500,000 Btu.).

A total of 92,734 tons of development ore was hoisted and conveyed; 12,370 tons was concentrated producing 10,919 tons of concentrate, which was sintered; 80,335 tons of ore was sintered without concentration. A total of 63,722 tons of sinter was produced.

SIR JAMES MINE

This property consists of 2 claims in mining location 2, 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.

Operations continued throughout 1960.

Diamond-drilling in 1960 consisted of 14 holes, totalling 2,281 feet, from surface.

A total of 1,066,502 tons of ore was hoisted and conveyed; 501,769 tons was concentrated, producing 458,498 tons of concentrate, which was treated in the sinter plant; 544,790 tons of ore was sintered without concentration. A total of 701,010 tons of sinter was produced.

GOUDREAU PYRITE

Algoma Ore Properties Limited awarded a contract to R. F. Fry and Associates Limited, for the mining of pyrite ore from the Rand No. 1, and Bear A and C groups of claims. The property consists of 10 claims, located in range 26, Township 27, in the Sault Ste Marie mining division. Plant and equipment used in the operation is owned and provided by the contractor. Operations continued throughout 1960.

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

Some 46 diamond-drill holes, totalling 4,814 feet, were completed from surface.

A total of 227,456 tons of pyrite was mined; 219,510 tons was sintered without concentration, producing 153,386 tons of sinter.

The average number of employees at mines was 804: 384 underground, and 420 on surface. C. M. Beck was general manager, and R. F. Palmer, mine manager, for Algoma Ore Division operations. The contractor employed an additional 28 men at the Goudreau operation.

ALGOMA STEEL CORPORATION DIVISION

The blast furnace section of the corporation is located at Sault Ste. Marie. Operations continued throughout 1960. No. 1 blast furnace has been dismantled; No. 2 furnace was idle.

PRODUCTION OF IRON, ALGOMA STEEL CORPORATION DIVISION

Furnace	1959		1960	
	Months of Operation	Production	Months of Operation	Production
		tons		tons
No. 3	11	227,654	10	207,466
No. 4	9	149,565	6	98,648
No. 5	12	473,765	10	502,431
No. 6	12	579,310	12	531,386
Total	—	1,430,294	—	1,339,931

No. 5 blast furnace was enlarged, and a venturi washer added; a pneumatic tap-hole drill was installed at No. 6 blast furnace; a second drum-filter was installed to handle flue dust; a 150-ton iron ladle was added.

The sintering plant of the corporation, located at Wawa, operated a total of 338 days during 1960, producing 568,478 tons of sinter.

The average number of employees in the blast furnace section was 677. 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 1960 and produced 86,695 tons of pig iron.

The average number of employees was 124. Thomas Cordner was general superintendent.

The following is taken from the corporation's annual report for the year ending 31 December 1960:

In September, the largest single mining operation of the Algoma Ore Properties Division was opened and named the George W. MacLeod mine in honour of the former President of Algoma Ore Properties Limited. Development of this mine, located in the Michipicoten district, began in 1951, and it is estimated to contain 48,000,000 gross tons of siderite ore on three levels, which will yield about 31,000,000 gross tons of Algoma sinter. It will be brought into full production in 1961 and will replace the Helen mine, which has been almost exhausted.

This mine, with its heavy-media separation plant, stocking equipment, laboratory, and service facilities, represents an investment to date of $19,000,000 and will be a major source of ore for the steelworks for many years to come.

Research directed towards further improvement in the metallurgical grade of Algoma sinter has been intensified in the past year, and satisfactory progress is being made.

Geological exploration and prospecting for iron ore in the district north of Sault Ste. Marie continued, and a number of occurrences were examined. Although nothing warranting commercial development was found, this work will continue in 1961.

Due to the sustained low rate of operations in the steel industry in the United States in 1960, and to a lesser extent in Canada, shipments of Algoma sinter dropped 26 percent from 1959. As a result, sinter production was restricted in the latter part of the year, and stocks held at Michipicoten increased. Production and shipments were as follows:

	Thousands of Gross Tons	
	1960	1959
Production	1,707	1,838
Shipments	1,429	1,922

Almost 50 percent of the shipments in 1960 were to the corporation's own blast furnaces.

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; P. E. Riverin, J. Monette, R. S. Newlin, and C. J. Parkinson, directors; A. R. McGinn, secretary-treasurer. The head office is on Eighth Street, New Toronto. The executive office and mine address is 105 North Cumberland Street, Port Arthur.

The property consists of 506 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 Cavell to the property, and to the Nakina-Geraldton road.

Operations at the property continued throughout 1960. The 100-ton-per-day pilot mill operated from July to December on metallurgical testing of bulk samples.

A total of about 1,040 feet of trenching, averaging 4 feet in depth, was completed in 1960. Some 110 diamond-drill holes, totalling 19,398 feet, were completed from surface.

New construction included a 92-man bunkhouse, an 18-room staffhouse, and a cookery, all steel buildings, steam heated. A building to house a 100-ton-per-day magnetic concentration pilot mill was completed, and the equipment and auxiliary facilities installed.

The average number of employees on surface was 110. J. B. Knaebel, president and managing director, was 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 of which 1,020 shares 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; Graydon Megan, secretary and director; J. L. Block, L. B. Hunter, J. F. Smith Jr., H. W. Johnson, and R. L. Peters, directors; P. P. Ribotto, vice-president; W. B. Cummings, treasurer and assistant secretary; W. H. Lowe, assistant treasurer; J. C. Carter, assistant secretary. The head office is at 30 West Monroe Street, Chicago 3, Ill., U.S.A. The mine address is Atikokan.

The property consists of 60 claims, in Schwenger township, District of Rainy River, and includes 31 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 Steeprock Lake.

Dredging operations on the C orebody in the Steep Rock range near Atikokan were completed in 1960.

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

Development work during 1960 consisted of 205 feet of drifting, 511 feet of crosscutting and 277 feet of raising. Total development footage to 31 December 1960 was as follows: 205 feet of drifts; 4,236 feet of crosscuts; 810 feet of raises. Some 14 diamond-drill holes, totalling 3,442 feet, were drilled from surface in 1960.

New construction in 1960 included an office and dry building (90 x 140 feet, 3 floors, steel and masonry construction), and an addition to the open-pit maintenance garage (80 x 120 feet, 1-storey, all-steel construction).

Major equipment added in 1960 was as follows:

2 underground trolley locomotives (Goodman, 10-ton, 80-hp.).
18 bottom-dump mine cars (Dorr-Oliver-Long, 125-cu. ft.).
1 Hewittic rectifier for underground trolley power (Northern Electric, 250-volts).
2 measuring pockets (Dorr-Oliver-Long, 160-cu. ft.).
1 electric stockpile shovel (P. & H., 1400, 5-yds.).
1 rotary drill for open pit (Bucyrus, 40R).
3 Haulpac trucks for open pit and stockpile (Le Tourneau–Westinghouse, 32-ton).
5 trucks for open pit (Euclid, 40-ton).
3 tractors (Caterpillar, two-D7, one-D8).

The open-pit operation commenced production in 1960. The total production was 876,837 tons, of which 764,894 tons was shipped.

The average number of employees was 196: 67 underground, and 129 on surface. P. P. Ribotto, vice-president, was in charge at the property.

Canadian Charleson Limited

Canadian Charleson Limited, incorporated in 1955, is a wholly-owned subsidiary of Charleson Mining Company of Hibbing, Minn. The directors and officers were: Frank Skubic, president and director; A. T. Steele, treasurer and director; J. J. Dwyer, Charles Remer, Edward Skubic, and B. Knudsen, directors; A. E. Wheeler, secretary. The head office is at 25 King Street West, Toronto. The executive office is at 2127 Sixth Avenue, Hibbing, Minn., U.S.A. The mine address is Box 1510, Atikokan.

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

The open pit and concentrator operated from 3 May to 30 September 1960.

New construction included a dry (20 x 20 ft.) and an addition to the mechanical repair shop (40 x 60 ft.), both Armco steel construction.

Major equipment added included the following:

1 tractor (Michigan 180, Clark Equipment Co.).
1 compressor (150 cfm., Atlas Copco).
1 screen (8 x 16 ft., Lecco).
1 belt conveyor (30 x 24 ins., 1,312 ft. long, Jeffrey Manufacturing).

A total of 1,489,333 tons of ore was transported, of which 135,237 tons was discarded. The concentrator treated 1,354,097 tons, averaging 9,027 tons daily, and produced washed, sized, and screened gravel as a by-product.

The average number of employees was 49: 33 in the open pit, and 16 on surface. G. H. McLeod was general superintendent.

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 to 31 December 1960. The directors and officers were: H. L. Isaacs, president and director; W. M. Gordon, secretary and director; G. T. Smith, treasurer and director; J. L. Kemmerer Jr., P. Porzelt, C. B. Schubert, and A. S. Miller, directors. 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 6 miles south of Kowkash on the Canadian National railway.

The company carried out an exploration and diamond-drilling program on an iron prospect. Trenching in sand, some 300 feet in length and averaging 35 feet in depth, was completed, after which a rock trench about 230 feet in length and averaging 8 feet in depth, was excavated producing some 2,000 tons of material. One carload was sent to the Ontario Research Foundation and two carloads to Ottawa for metallurgical testing. Diamond-drilling in 1960 consisted of 16 holes, totalling 7,766 feet, from surface.

New construction in 1960 included: 1 assay laboratory (18 x 46 ft.); 1 guest house (18 x 26 ft.); 1 bunkhouse (18 x 26 ft.); 1 kitchen (18 x 23 ft.); 1 garage (10 x 28 ft.); all these were of wood construction with asbestos shingles.

The assay laboratory was equipped for making iron determinations, and a house-trailer (10 x 46 ft.) was supplied.

The average number of employees was seven. M. D. Isbister, consulting mining engineer, was in charge at the property, assisted by Dr. B. K. Meikle.

Dominion Foundries and Steel Limited

Dominion Foundries and Steel Limited was incorporated in May 1917. The authorized capitalization was 51,738 preferred shares of $100 par value and 5,000,000 common shares of no par value, of which 30,650 preferred and 3,522,317 common shares have been issued. The directors and officers were: F. A. Sherman, chairman; A. G. Wright and F. A. Loosley, vice-chairmen; F. H. Sherman, president; D. F. Hassel, vice-president; A. C. Anderson, vice-president and general sales manager; 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 is at Hamilton.

The new No. 3 blast furnace, and its auxiliary equipment and units, were completed on schedule, which permitted "blowing-in" on 24 August. No. 1 furnace, which had operated continuously since 1951, was "blown-out" on 28 August, preparatory to relining and repairs to the auxiliary equipment.

The greater heating capacity of the three new stoves of No. 3 furnace, and the stainless steel blow-pipes, permit a higher operating blast temperature and accommodate the trend to pellets and beneficiating materials with higher iron content. The dust collection units have yielded a cleaner blast furnace gas. The research department of the oil supplier is working in conjunction with the company on an oil-injection process. Oil is admitted at the tuyers, its purpose being the reduction of the coke rate. Initial results have been favourable.

Construction was started on the Bay water system to replace existing gravity water supply.

The company uses pipelines to supply the adjoining Cyanamid of Canada plant with such by-products as nitrogen gas, coke-oven gas, blast-furnace gas, and steam at 400 pounds per square inch, which are used in the Cyanamid plant to produce urea.

PRODUCTION OF IRON, DOMINION FOUNDRIES AND STEEL

Furnace	1959		1960	
	Operated	Production	Operated	Production
	days	tons	days	tons
No. 1	365	746,241	241	239,891
No. 2	365		356	401,118
No. 3	nil	nil	128	137,752
Total	—	746,241	—	778,861

The average number of company employees and employees of contractors in the blast furnace division was 210. H. C. Taylor was superintendent; Lloyd Thomas was assistant superintendent.

Lowphos Ore Limited

Lowphos Ore Limited, incorporated in July 1941, is a subsidiary of National Steel Corporation and operates under the direction of the Hanna Iron Ore Division of the corporation. The directors and officers were: W. A. Marting, president and director; R. W. Whitney, vice-president and director; G. W. Humphrey, director; R. H. Bartholomew, vice-president; 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, about 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 1960.

Some 15 diamond-drill holes, totalling 2,400 feet, were drilled from surface.

A total of 1,333,380 tons of ore was mined in the open pit; 1,330,977 tons was milled, averaging 3,647 tons per day.

The average number of employees was 185: 100 in the open pit, and 85 on surface. S. A. Mahon 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: A. F. Peterson, president and director; P. S. Killian, and N. Berkeley, vice-presidents and directors; F. R. Brugler, comptroller and director; B. D. Broeker, secretary and director; H. O. Olsen, vice-president and general superintendent; P. B. Entrekin, W. H. Johnstone, E. P. Leach, and R. E. McMath, vice-presidents; E. W. Morris, treasurer. The head office and mine offices are at Marmora. The executive office is at Wilmington, Delaware, U.S.A.

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

The open pit and mill operated from 1 January to 30 June, 18 July to 30 September, and 14 November to 31 December 1960.

A total of 1,131,464 tons was mined in the open pit, from which 358,201 tons was discarded. The mill treated 773,263 tons of ore, averaging 2,740 tons daily.

The average number of employees was 302: 70 in the open pit, and 232 on surface. H. O. Olsen, vice-president and general superintendent, was in charge of operations at the property; S. J. Shale was manager.

Noranda Mines Limited

Noranda Mines Limited was incorporated in May 1922, with an authorized capitalization of 6,000,000 shares of no par value, of which 4,479,894 shares have been issued. The directors and officers were: J. R. Bradfield, president; R. V. Porritt, vice-president and general manager; F. M. Connell, Hon. G. B. Foster, J. Y. Murdoch, J. I. Rankin, Jean Raymond, H. L. Roscoe, L. H. Timmins, J. R. Timmins, W. S. Row, A. O. Dufresne, and N. C. Urquhart, directors; C. H. Windeler, secretary; R. G. Rudolf, treasurer. The head office is at 44 King Street West, Toronto.

SULPHURIC ACID DIVISION
(Cutler Plant)

The company's sulphur-iron division located on the north shore of Lake Huron, in the Serpent River Indian Reserve, Lewis township, District of Algoma, operated throughout 1960.

The plant supplies a large part of the sulphuric acid used in the leaching of the uranium ore in the Elliot Lake area.

The following table shows the number of tons of material received and processed during 1959 and 1960:

	1959	1960
Pyrite.....long tons	177,679	131,854
Pyrrhotite.....long tons	40,478	29,156

The following table shows the production during the two years:

	1959	1960
Sulphuric acid (60° B 100 percent).....net tons	372,000	222,588
Iron sinter.....long tons	82,874	53,434
Iron calcine.....long tons	59,187	76,454

The average number of employees was 205. T. R. Wearing was plant manager.

Steel Company of Canada Limited

Steel Company of Canada Limited was incorporated in June 1910, with an authorized capitalization of 2,000,000 preferred shares of $5 par value, and 3,000,000 common shares of no par value. In April 1953, the capitalization was changed to 5,133,328 common shares of no par value, 4,338,338 of which 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; E. G. Baker, Allan Graydon, G. A. R. Hart, Frederick Johnson, R. A. Laidlaw, L. L. Lang, R. H. McMaster, H. Greville Smith, and W. Taylor-Bailey, directors: R. B. Taylor, vice-president and treasurer; N. J. Brown, vice-president and comptroller; H. M. Mawhinney and H. J. Clawson, vice-presidents; W. C. Chick, secretary and assistant treasurer; J. G. Collinson, 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, STEEL COMPANY OF CANADA, 1959 AND 1960

Furnace	1959		1960	
	Operated	Pig Iron Produced	Operated	Pig Iron Produced
	days	tons	days	tons
A	304	97,441	362	102,963
B	362	272,306	221	179,169
C	285	350,207	286	349,404
D	288	566,086	347	692,235
Total	——	1,286,040	——	1,323,771

Self-fluxing sinter was produced at the maximum rate during 1960 to augment the charge to the blast furnaces. Extensive additions to the sinter plant are currently being reviewed with a view to finding the best method of achieving an increase in blast furnace capacity.

The average number of employees was 426. C. M. Birkett was works manager, J. S. McMahan was superintendent, and J. A. Peart, assistant superintendent in the blast furnace division.

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 stock. The number of shares issued at 31 December 1960 was: common, 8,045,110; preferred, none. The officers and directors were: Cyrus S. Eaton, chairman of the board and director; M. S. Fotheringham, president, general manager, and director; Neil Edmonstone, vice-president and secretary-treasurer; 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, Steeprock Lake area, District of Rainy River.

Operations continued throughout 1960. The amount of ore mined during the year is shown in the following table:

	Tons
A orebody (Hogarth, open pit)	2,267,772
B orebody (Errington, underground)	291,040
	2,558,812

A total of 1,586,253 tons of ore was shipped.

A (HOGARTH) OREBODY

Open-pit mining continued throughout 1960; 2,267,772 tons of ore was mined. A total of 1,899,533 cubic yards of stripping was completed.

Some 40 diamond-drill holes, totalling 13,151 feet, were drilled from surface.

New equipment added included: 1 rear-end dump truck (KW, Dart, 40-ton, Sicard Co., Montreal), and 2 tractors (Caterpillar D8, Powell Equipment, Port Arthur).

Preparations for underground mining were continued.

SHAFTS, A (HOGARTH) OREBODY

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

Development footage in 1960 consisted of 268 feet of drifting, 1,204 feet of crosscutting, and 448 feet of raising. Total development footage to 31 December 1960 was as follows: 316 feet of drifts; 2,492 feet of crosscuts; 1,040 feet of raises.

New equipment installed included the following:

2 bottom-dump skips at A-2 shaft (22-ton capacity, Dorr-Oliver-Long).
2 loading-pockets at 900- and 110-foot levels (110-ton capacity, with 22-ton measuring-pockets, Dorr-Oliver-Long).
2 pumps at 110-foot level (200-hp., 1,500-gpm.; 450-hp., 2,200-gpm.; submersible, Byron Jackson).
1 pump at shaft bottom (20-hp., 250-gpm., Byron Jackson).

B (ERRINGTON) OREBODY

Underground mining on the B (Errington) orebody continued throughout 1960.

SHAFTS, B (ERRINGTON) OREBODY

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

Development footage in 1960 consisted of 4,901 feet of drifting, 161 feet of crosscutting, and 792 feet of raising. Total development footage to 31 December 1960, was as follows: 32,564 feet of drifts; 13,054 feet of crosscuts; 7,700 feet of raises. Diamond-drilling in 1960 consisted of two holes totalling 508 feet from underground.

The following is taken from the president and general manager's report for the year ending 31 December 1960:

Operations and Development

Shipments from the open pit totalled 1,394,802 tons; 191,451 tons came from the Errington underground mine.

Open-pit operations on the Hogarth mine will be completed, as anticipated, in 1961. The G ore-zone open pit, with designed annual capacity of 1,500,000 tons, will be ready for production in 1962.

Cash expenditures on capital and development projects in 1960 amount to $5,123,000. Plant and equipment accounted for $893,000, while $4,230,000 was spent on forward development mainly dredging on the G ore-zone. Completion of the G dredging project in 1961 will eliminate the largest single requirement of recent years for capital expenditure.

Development work proceeded on the Hogarth underground mine, with cash expenditures of $510,000 being mainly applied to underground workings. This new mine, which is designed for annual capacity of 2,500,000 tons, can be readied for initial production in 1963.

Research and experiments on new underground methods made satisfactory progress during the year. This work is being carried forward actively to enable the earliest possible realization of high-level underground production, with minimum costs and maximum profits.

The metallurgical staff has been proceeding with its valuable research to assist the sales program. Technological information is constantly being obtained to ensure the continued acceptance of Steep Rock iron ores as desirable high-quality furnace feed.

Ore Reserves

The orebodies of the Steep Rock range are subjected to progressive exploration by diamond-drilling and other means. This systematic work has given positive assurance that high-volume production can be maintained from the various ore deposits for many decades. Steep Rock ores are of high quality and easily amenable to simple methods of beneficiation. They present no significant problems of capital, operating costs, or maintenance of earnings should more advanced forms of beneficiation become desirable in the future from the customers' point of view.

The technology and economics of full-scale production of sinter and pellets from Steep Rock ores are under current study and evaluation, in case the future may warrant emphasis on such products. Contrary to a common misconception that only magnetite ore may be pelletized, high-quality pellets and sinter have been produced in experiments using Steep Rock hematite ore throughout. High-quality pellets are also being made on a commercial scale from non-magnetic ores in several plants in North America.

Exploration

During the year the company completed thorough and extensive feasibility studies on its Lake St. Joseph property, which appears capable of annual production of 3,000,000 tons of pellets, as noted in last year's annual report. The studies indicate that this major new deposit can support profitable open-pit production for a period of at least 50 years, with a large reserve remaining for subsequent open-pit or underground operation, depending on economics then existing.

The company expects to develop the Lake St. Joseph property, in partnership with consuming interests, on a royalty basis. The comprehensive feasibility and engineering report is now under consideration by several consumers of iron ore who have indicated an interest in the property.

The average number of employees was 968: 544 underground, and 424 on surface. M. S. Fotheringham, president and general manager, was in charge of operations at the property.

Strategic-Udy Metallurgy Limited

Strategic-Udy Metallurgical and Chemical Processes Limited is a subsidiary of Strategic Materials Corporation, incorporated in October 1955. In December 1960, the name was changed to Strategic-Udy Metallurgy Limited. The authorized capitalization is 1,000 shares of no par value, all of which have been issued. The directors and officers were: J. C. Udd, chairman; F. W. Chambers, president and director; R. O. Denman, executive vice-president and director; F. C. Senior, general manager and director; W. S. Douglas, assistant general manager; E. H. Damon, secretary; W. H. Dalman, treasurer. The head office and plant is at 3527 Stanley Avenue, Niagara Falls.

The company is engaged in research and development of metallurgical processes. Work was continued during the year on the reduction and recovery of iron and ferro-manganese alloys from manganiferous ores, also on the recovery of iron and the selective reduction of lateritic ores for the production of ferro-nickel, ferro-chromium, and steel.

Construction of an addition to the plant was in progress. The addition will be equipped with a kiln and electric furnace for the production of ferrochrome.

The average number of employees was 107. F. C. Senior was general manager; J. D. Mooney was plant superintendent.

Tinto Iron Mines Limited

Tinto Iron Mines Limited was incorporated in August 1960, with an authorized capitalization of 6,500,000 shares of $1 par value, of which 1,805,000 had been issued to 31 December 1960. The directors and officers were: Hon. R. H. Winters, president and director; W. H. Bouck, vice-president and director; W. B. Malone, treasurer and director; W. D. McCoy and Lord Lovat, directors; George Baker, secretary. The head office is at 335 Bay Street, Toronto 1. The correspondence address is c/o D. E. Howard, Quirke Mine, Elliot Lake.

The property consists of 118 claims located in Scholes, Belfast, Phyllis, and Joan townships, District of Nipissing. It was formerly operated by North American Rare Metals Limited, and a considerable amount of work was completed prior to the suspension of operations in October 1959.

Operations commenced on 3 June and continued until 16 December 1960.

A vertical, three-compartment shaft was sunk by the previous operator to a depth of 621 feet on claim T-37963, in 1959. The shaft was sunk a further 557 feet to a total depth of 1,178 feet below surface, by Tinto Iron Mines in 1960. The 500 pump station, 1,000 access, and 11th level were established at depths of 497, 1,001, and 1,099 feet, respectively, below the collar. A total of 1,303 feet of

drifting, 681 feet of crosscutting, and 33 feet of raising was completed on the 11th level; this is the accumulated total of development footage to 31 December 1960.

Diamond-drilling in 1960 consisted of 46 holes totalling 19,391 feet from underground, and 7 holes totalling 15,764 feet from surface.

Four dormitories (16 x 24 ft.), of timber construction, were erected.

The average number of employees supplied by the company and contractor was 16: 7 underground, and 9 on surface. D. E. Howard, engineer, was in charge of operations at the property.

LEAD AND ZINC

Lead production was down 48.15 percent in quantity and 48.09 percent in value from the 1959 production. Zinc production increased 0.55 percent in quantity and 9.67 percent in value over the 1959 production. With the exception of 148,400 pounds of lead recovered in the refining of the silver-cobalt ores from mines in the Cobalt-Gowganda area, all of this lead and zinc was produced in the Manitouwadge area.

The mines there paid $808,914 to 158 salaried employees and $3,138,041 to 626 wage-earners. They used fuel and electricity worth $499,294 and process supplies worth $1,474,404.

For operations at the mines see NICKEL AND COPPER.

MAGNESIUM AND CALCIUM

These metals are produced in Ontario by Dominion Magnesium Limited. Calcium production doubled in quantity and value in relation to the 1959 production. Magnesium production increased 78.97 percent in quantity and 95.87 percent in value over the 1959 production.

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 1960 at the company's quarry and plant about 3 miles from Haley, in concessions V and VI, Ross township, Renfrew county.

New construction consisted of an ingot warehouse (100 x 50 ft.).

Production of metals in 1960 was as follows:

	Pounds
Calcium metal	144,372
Magnesium metal	15,040,383
Thorium	32,381
Titanium	2,115
Barium	529
Strontium	44

The following is taken from the report of the president and the general manager for the year ending 31 December 1960.

Six reduction furnaces were producing magnesium at the beginning of the year, and by 18 March the plant operated at its full capacity of ten furnaces, which rate was maintained throughout the remainder of the year.

The main research program has continued in the direction of improving reduction-furnace design. As a result, a pilot furnace is being installed on the reduction floor for evaluation and will be in operation by the spring of 1961.

The average number of employees was 375: 365 in the plant, and 10 in the quarry. D. J. McPhail was plant manager.

NICKEL AND COPPER

Production of nickel increased 15.92 percent in quantity and 15.77 percent in value over 1959 production. Copper increased 9.56 percent in quantity and 11.95 percent in value.

The output of copper from the mines of the Manitouwadge and Timagami areas decreased 7.31 percent in quantity and 5.18 percent in value from the 1959 production. These areas produced 57,487,000 pounds valued at $17,412,700. Resumed activity in Kashabowie brought 11,462,900 pounds valued at $3,472,121 into the total for the province.

NICKEL AND COPPER MINING AND SMELTING

	1956	1957	1958	1959	1960
	tons	tons	tons	tons	tons
Ore treated	15,798,970	16,474,142	11,735,895	16,554,454	19,002,040
Copper in blister produced in Ontario	141,304	155,987	125,895	170,116	186,046
Nickel produced in Ontario	108,613	117,992	71,422	110,282	126,243
Matte exported	95,675	99,817	93,748	107,131	125,333
Nickel content of matte exported	58,391	60,364	55,899	63,682	75,407
Copper content of matte exported	14,966	15,900	16,185	18,156	20,226

PRECIOUS METALS RECOVERED

		1956	1957	1958	1959	1960
Platinum Metals	oz.	314,818	416,147	300,458	329,081	483,585
	$	22,407,090	25,731,333	14,321,443	16,932,178	28,871,955
Gold	oz.	44,129	43,391	47,367	42,509	56,665
	$	1,520,245	1,455,768	1,609,530	1,427,027	1,923,777
Silver	oz.	1,391,545	1,576,138	1,217,510	1,384,223	1,665,314
	$	1,247,938	1,376,188	1,056,920	1,215,071	1,480,631
Total	$	25,175,273	28,563,289	16,987,893	19,574,276	32,276,363

The nickel-copper industry of Sudbury milled 18,036,036 tons of ore which yielded 403,171,000 pounds of nickel valued at $277,793,767 and 343,320,000 pounds of copper valued at $102,782,247. There was about 128,800 pounds of nickel, valued at $130,400, produced outside this area.

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
1956	4	$61,131,568	18 mines[1]	955	$ 6,093,001	9,901	$44,079,494	Nickel in matte	$ 71,345,815
			3 smelters	1,066	5,954,658	6,063	26,081,794	Metallic nickel	122,161,530
			2 refineries	336	1,895,705	2,684	11,132,512	Nickel oxide and salts	14,021,419
								Copper in matte	11,539,238
								Converter copper	114,508,139
								Gold	1,520,245
								Silver	1,247,938
								Platinum metals	22,407,090
								Selenium and tellurium	1,484,640
								Cobalt	5,519,843
								Pyrrhotite	759,449
								Sulphur	534,810
Total		$61,131,568		2,357	$13,943,264	18,648	$81,293,800		$367,050,156
1957	4	$65,206,713	20 mines[1]	1,047	$ 7,069,063	10,338	$49,003,038	Nickel in matte	$ 79,601,346
			4 smelters	1,145	6,962,569	6,494	29,542,695	Metallic nickel	143,163,737
			2 refineries	363	2,132,908	2,682	11,836,568	Nickel oxide and salts	20,221,978
								Copper in matte	8,427,008
								Converter copper	83,741,114
								Gold	1,455,768
								Silver	1,376,188
								Platinum metals	25,731,333
								Selenium and tellurium	963,150
								Cobalt	4,889,505
								Pyrrhotite	685,335
								Sulphur	542,846
Total		$65,206,713		2,555	$16,164,540	19,514	$90,382,301		$370,799,308
1958[2]	3	$42,425,991	16 mines[1]	1,003	$ 6,940,510	9,334	$35,348,771	Nickel in matte	$ 76,338,284
			4 smelters	1,105	7,607,745	6,153	21,096,430	Metallic nickel	90,601,931
			2 refineries	347	2,243,207	2,303	7,542,760	Nickel oxide and salts	10,108,807
								Copper in matte	7,526,058
								Converter copper	45,890,976
								Gold	1,609,530
								Silver	1,056,920

								Platinum metals	14,321,443
								Selenium and tellurium	688,589
								Cobalt	3,359,984
								Pyrrhotite	655,569
								Sulphur	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]	975	7,146,760	9,220	45,601,540	Nickel in matte	$ 85,970,920
			4 smelters	1,108	7,112,238	6,308	29,320,254	Metallic nickel	138,036,499
			2 refineries	374	2,476,620	2,538	11,219,286	Nickel oxide and salts	15,912,284
								Copper in matte	9,804,234
								Converter copper	82,322,026
								Gold	1,427,027
								Silver	1,215,071
								Platinum metals	16,932,178
								Selenium and tellurium	724,635
								Cobalt	4,451,593
								Pyrrhotite	632,140
								Sulphur	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]	1,093	8,071,601	10,209	$51,784,392	Nickel in matte	$101,799,347
			4 smelters	1,151	7,562,771	6,523	31,341,853	Metallic nickel	153,956,279
			2 refineries	409	2,786,892	2,710	12,512,226	Nickel oxide and salts	22,038,141
								Copper in matte	11,043,287
								Converter copper	91,738,960
								Gold	1,923,777
								Silver	1,480,631
								Platinum metals	28,871,955
								Selenium and tellurium	1,037,575
								Cobalt	5,696,208
								Pyrrhotite	762,661
								Sulphur	985,717
Total		$50,158,396		2,653	$18,421,264	19,442	$95,638,471		$421,334,538

[1]The figures for "mines" include the following that were active but non-producing:
1956—Crean Hill (International Nickel), Boundary and Onaping (Falconbridge), and Jonsmith Mines Limited.
1957—Crean Hill (International Nickel), Boundary and Onaping (Falconbridge), Coppercorp, Jonsmith, and Temiskaming Inspiration.
1958—Crean Hill (International Nickel), Boundary and Onaping (Falconbridge).
1959—Crean Hill, Victor (International Nickel), Boundary (Falconbridge).
1960—Clarabelle, Copper Cliff North, Crean Hill (International Nickel), Boundary, Strathcona (Falconbridge).
[2]Only 9 month's operation by International Nickel Company of Canada Limited.

Also recovered in the processing of the ores of the Sudbury area was the entire amount of Ontario's platinum metals, selenium and tellurium, and 89 percent of its cobalt. A complete list of production of metals for the industry is given in the table on pages 80-81. The value of precious metals recovered was $32,276,363. The industry paid $18,421,264 to 2,653 salaried employees and $95,638,471 to 19,442 wage-earners. Fuel and electricity used cost $23,161,269, and process supplies cost $32,101,561.

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. No. 1 and No. 2 sulphuric acid plants, and the liquid sulphur dioxide plant, are located at Copper Cliff.

No. 1 plant produced 48,803 tons of acid, averaging 133 tons daily.

No. 2 plant produced 110,647 tons of acid, averaging 302 tons daily.

The liquid sulphur dioxide plant produced 85,073 tons.

The average number of employees was 98. A. A. Perley was works manager.

Ethel Copper Mines Limited

Ethel Copper Mines Limited was incorporated in November 1952, with an authorized capitalization of 3,000,000 shares of $1 par value, of which 1,741,520 shares have been issued. The directors and officers were: G. S. Welsh, president and director; G. W. Carnegie, vice-president and director; V. N. Harbinson, secretary and director; Ethel Welsh, treasurer and director; H. A. Campbell, director. The head office and mine office address is 80 Richmond Street West, Toronto.

The company's holdings comprise 22 claims located in James, Tudhope, and Powell townships, District of Timiskaming. The James township property, where work was conducted from May to December 1960, is in the Elk Lake area.

A shaft inclined at 20 degrees was advanced westward along the vein a distance of 155 feet commencing at the boundary of Tudhope and James townships and located on claim No. 10316 in James township. About 1,000 tons of material was removed, which was reported to grade 3.75 percent copper, plus some gold and silver. Three diamond-drill holes, totalling 200 feet, were drilled from underground.

Two frame buildings were constructed at the property.

G. S. Welsh, president, was in charge of operations, and the average number of employees was two.

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 3,766,922 have been issued. The directors and officers were: H. J. Fraser, president and director; R. Campbell, executive vice-president, secretary, 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 (production); G. S. Jewett, vice-president (sales); A. W. Coome, treasurer; J. L. Matthews, assistant secretary. The head office is at 44 King Street West, Toronto. The mine address for the properties in the Sudbury area is Falconbridge.

The company has nickel-copper mines, and concentrating and smelting operations in the Sudbury area, and operates a refinery at Kristiansand, Norway.

The average number of employees, exluding employees of contractors, employed at mining operations was 2,854. R. M. Oliver was manager; J. H. Fraser was general superintendent at the Falconbridge, East, and McKim mines; G. A. Allen was general superintendent at the Hardy, Longvack, Boundary, Onaping, Fecunis, and Strathcona mines.

The company financed the development of Norduna Mines Limited. Further information on this is given under Norduna Mines Limited (p. 87).

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

	Inclination	Number of Compartments	Sinking in 1960	Total Depth from Surface
			feet	feet
FALCONBRIDGE				
No. 1 shaft	Vertical	3	——	2,848
No. 5 shaft	Vertical	6	——	4,347
No. 7 shaft	Vertical	3	——	1,692
No. 9 (winze, below 4,025-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	17	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°	——	——	1,163
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
LONGVACK				
Longvack shaft	17½°	2	——	854
STRATHCONA				
No. 1 shaft	Vertical	4	46	46

FALCONBRIDGE MINE

The Falconbridge property comprises 24 claims in Falconbridge township, Sudbury District.

During the year a total of 2,325 feet of drifting, 4,329 feet of crosscutting, and 2,035 feet of raising was completed. Total development footage to 31 December 1960 was as follows: 181,214 feet of drifts; 40,656 feet of crosscuts; 99,717 feet of raises. A total of 165 diamond-drill holes, totalling 15,476 feet, were completed in 1960 from underground; outside exploration on Sudbury Basin properties included 33 diamond-drill holes, totalling 64,502 feet, from surface, and 5 holes, totalling 6,716 feet, from underground. The following development footage was completed in 1960 from the 2,650-foot level of the International Nickel Company of Canada Limited, Levack mine for Falconbridge, in the Fecunis mine area: 262 feet of drifting, 43 feet of crosscutting, 59 feet of raising. Total development footage in this area to 31 December 1960 was as follows: 369 feet of drifts, 54 feet of crosscuts, 59 feet of raises.

This work was under the direction of A. M. Clarke, Falconbridge senior mine geologist.

New construction in 1960 consisted of a timber yard storage shed (28 x 32 x 16 feet high; timber construction).

New equipment added was as follows: 1 Alimak raise platform; 1 Joy Craig raise platform; 2 feeders (Syntron Twin) at the 6,125-foot level; 2-feeders (United Steel) at the 4,025- and 6,200-foot levels; 1 jaw-crusher (36 x 48 ins., 150-hp. motor, Canadian Vickers) at 6,125-foot level; 1 dust collector (5,000 cfm., Wheelabrator) at the 6,125-foot level; 1 radio communication to cage and slack-rope indicator (Canadian Westinghouse); 1 cage (5.5 x 5.3 ft., Dorr-Oliver-Long) for No. 5 shaft.

A total of 670,445 tons of ore was hoisted.

The average number of employees was 864: 656 underground, and 208 on surface. R. R. Holmes was mine superintendent.

EAST MINE

The property comprises 12 claims in Falconbridge township, Sudbury District.

During the year, 1,377 feet of drifting, 340 feet of crosscutting, and 923 feet of raising was completed. Total development footage to 31 December 1960 was as follows: 27,064 feet of drifts; 6,647 feet of crosscuts, 12,702 feet of raises. Some 69 diamond-drill holes, totalling 6,144 feet, were drilled from underground in 1960.

A diesel locomotive (25-hp., Hunslet, Tiger Tim) was added to underground equipment.

A total of 272,307 tons of ore was hoisted.

The average number of employees was 146: 134 underground, and 12 on surface. M. J. Chesser was mine superintendent.

McKIM MINE

The property comprises 12 claims in McKim township, Sudbury District.

No. 2 winze (below 1,000-foot level) was sunk a further 17 feet to a depth of 2,437 feet below surface.

During the year, 236 feet of drifting, 489 feet of crosscutting, and 491 feet of raising was completed. Total development footage to 31 December 1960 was as follows: 13,540 feet of drifts, 9,937 feet of crosscuts, 10,387 feet of raises. Some 75 diamond-drill holes, totalling 5,136 feet, were completed from underground during 1960.

A total of 107,820 tons of ore was hoisted; 108,895 tons was shipped.

The average number of employees was 112: 93 underground, and 19 on surface. J. A. MacMillan was mine superintendent.

HARDY MINE

The property comprises two claims in Levack township, Sudbury District.

During the year, 595 feet of drifting and 66 feet of crosscutting was completed. Total development footage to 31 December 1960 was as follows: 14,798 feet of drifts, 17,882 feet of crosscuts, 12,912 feet of raises. Diamond-drilling in 1960 consisted of 16 holes, totalling 2,993 feet, from underground.

New equipment added included: a dust collector at No. 1060 crusher station (Wheelabrator, 5,000 cfm.); 2 slusher hoists (Canadian Ingersoll-Rand H-5NNIK); 2 slusher hoists (Joy, AF212).

A total of 381,622 tons of ore was hoisted; 382,422 tons was milled.

The average number of employees at the mine and concentrator was 375: 145 underground, and 230 on surface. J. Bardswich was mine superintendent.

BOUNDARY MINE

The property comprises one claim in Levack township, Sudbury district.

During the year, 393 feet of drifting and 347 feet of crosscutting was completed. Total development footage to 31 December 1960 was as follows: 7,570 feet of drifts, 2,086 feet of crosscuts, 560 feet of raises. Some 29 diamond-drill holes, totalling 4,173 feet, were completed from underground.

A total of 867 tons of ore was hoisted and milled.

The average number of employees was 10: 9 underground, and 1 on surface. J. Bardswich was mine superintendent.

ONAPING MINE

The property comprises 1½ claims in Levack township, Sudbury district.

During the year, 1,666 feet of drifting, 347 feet of crosscutting, and 1,202 feet of raising was completed. Total development footage to 31 December 1960 was as follows: 5,512 feet of drifts, 8,072 feet of crosscuts, 1,774 feet of raises. Some 52 diamond-drill holes, totalling 10,220 feet, were completed in 1960 from underground.

A total of 18,548 tons of ore was hoisted; 18,744 tons was milled.

The average number of employees was 47: 32 underground, and 15 on surface. J. Bardswich was mine superintendent.

LONGVACK MINE

The property comprises four claims in Levack township, Sudbury district.

During the year, 391 feet of drifting, 50 feet of crosscutting, and 108 feet of raising was completed. Total development footage to 31 December 1960 was as follows: 4,731 feet of drifts, 1,186 feet of crosscuts, 3,011 feet of raises. Some 10 diamond-drill holes, totalling 538 feet, were drilled from underground during 1960.

A total of 240,795 tons of ore was hoisted, from which 1,105 tons was discarded; 239,690 tons was delivered for milling.

The operation of the mine was contracted to Temiskaming Inspiration, who employed an average of 75 men: 45 underground, and 30 on surface. E. N. Gilje was mine superintendent, and the company supplied 4 men.

FECUNIS LAKE MINE

The property comprises two claims in Levack township, Sudbury district.

During the year, 368 feet of drifting, 28 feet of crosscutting, and 112 feet of raising, was completed. Total development footage to 31 December 1960 was as follows: 16,498 feet of drifts, 13,423 feet of crosscuts, 12,055 feet of raises. Some 41 diamond-drill holes, totalling 5,699 feet, were drilled from underground in 1960.

New underground equipment was as follows: 10 mine cars (110-cu. ft., Granby type, Dorr-Oliver-Long); 6 slusher hoists (3-drum, Canadian Ingersoll-Rand).

A total of 752,939 tons of ore was hoisted; 754,874 tons was 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 140: 26 underground, and 114 on surface. E. N. Gilje was mine superintendent.

STRATHCONA MINE

The property comprises 5 claims located in Levack township, Sudbury district.

The vertical, four-compartment No. 1 shaft, located in the south half of lot 4, concession 4, Levack township, had been collared and sunk 46 feet at the year's end.

New construction in 1960 included the following: headframe and bin house (38 x 122 x 160 ft. high, concrete foundations, steel frame, asbestos siding and roofing); hoisthouse and dry (60 x 107 x 26 ft. high, steel frame, tile walls); substation (22 x 38 x 27 ft. high, concrete piers, timber tower); septic tank (20 x 31 x 10 ft., concrete); service tunnel (8 x 8 ft. x 158 ft. long, concrete).

New equipment installed included a mine hoist (144 x 78 ins. 1,500 fpm., 60,000 lb. rope pull, 1,250 hp., Canadian Ingersoll-Rand); an automatic oil-fired boiler (300 sq. ft. heating surface, Napanee Iron Works).

The work at the property was done under contract. G. M. Proudfoot, project superintendent for Falconbridge was in charge.

FALCONBRIDGE ROCKHOUSE CONCENTRATOR

New construction in 1960 consisted of a three-bay extension to the concentrator (60 x 60 x 35 ft. high, concrete foundation and floor, steel frame, tile walls, cavity deck and built-up roof).

New equipment installed included a ball mill (Hardinge Tricone, 10.5 x 10 ft. x 9 ins., with 500-hp. motor); 1 dust collector in the rockhouse (8,000-cfm., Wheelabrator); and 4 Krebs cyclones (D-10-B, Technequip Co.).

During the year a total of 989,803 tons of ore was milled, producing 128,201 tons of concentrate. The concentrator averaged 2,747 tons daily.

W. R. Lyford was mill superintendent.

HARDY CONCENTRATOR

New equipment installed included a magnetic separator on the flotation floor (No. C-551, capacity 20-tph., Jeffrey Mfg. Co.).

During the year a total of 528,042 tons of ore was milled, and 96,881 tons of concentrate was produced. The concentrator averaged 1,580 tons daily.

Stan. McQuitty was mill superintendent.

FECUNIS CONCENTRATOR

During the year a total of 844,480 tons of ore was milled, and 134,582 tons of concentrate was produced. The concentrator averaged 2,453 tons daily.

K. C. Mott was mill superintendent.

FALCONBRIDGE SMELTER

New construction in 1960 included extensions to the pyrrhotite plant as follows: leach section (95 x 149 x 23 ft. high) and iron-ore section (68 x 92 x 38 ft. high), both with concrete foundations, steel-frame, tile walls, cavity deck, and built-up roof; a concrete stack (400 feet high, 7 ft. 4 in.-diameter at top); a gas line (6-in. diameter, 840 ft. long) from pressure-reducing station to smelter.

New equipment added included the following:

1 matte breaker (John Hepburn Ltd.).
1 American filter (6- x 8-ft. disc, Dorr-Oliver-Long).
2 thickeners (40 x 10 ft., Dorr-Oliver-Long).
3 thickeners (30 x 10 ft., Dorr-Oliver-Long).

The smelter treated concentrates from the Falconbridge, Hardy, and Fecunis concentrators, producing 69,705 tons of nickel matte.

The average number of employees was 1,130.

J. H. Fraser was general superintendent.

The following is taken from the company's annual report for the year ending 31 December 1960:

Metal Deliveries

Deliveries of the principal metals, nickel, copper, and cobalt, were substantially higher in 1960 than in any previous year. Nickel deliveries at 65,002,000 pounds were 6,589,000 pounds, or more than 11 percent, above the previous record established in 1959. Copper deliveries at 36,012,000 pounds were 3,284,000 pounds, or slightly more than 10 percent, above the previous record in 1959. Cobalt deliveries at 827,000 pounds were 95,000 pounds, or about 13 percent, more than deliveries in 1959, and were about 50,000 pounds more than the previous record set in 1957.

Deliveries of liquid sulphur dioxide also set a new record in 1960. The quantity of precious metals delivered fell below the 1959 record, but the higher prices in 1960 largely compensated for the difference in deliveries.

The quoted market price for nickel in terms of U.S. currency, which was established in December 1956, did not change during 1960. Copper prices declined rather appreciably during the year, but as noted above, the average price realized in 1960 was higher than the average in 1959. The market price for cobalt dropped by 25 cents a pound on 1 March 1960.

Mines

	1960	1959
Ore delivered to treatment plants from company mines.....tons	2,429,803	2,232,937
Development advances.....feet	19,736	19,221
Diamond-drilling.....feet	117,972	129,747

The deliveries of ore from company mines to treatment plants were at a record level and exceeded deliveries of the previous year by about 9 percent.

Considerable progress was made in opening up the block of ground between the 4,000- and 6,000-foot levels in the Falconbridge mine. Pump- and crusher-stations were excavated, ore-passes were driven, and crosscutting to the orebody was proceeding on the different levels at the year's end. The ore transfer system between the two main shafts, No. 5 and No. 9, was essentially completed. In the East mine, drifting on levels below the 2,800-foot horizon towards the easterly boundary disclosed average mine-grade ore. At the McKim mine the two bottom levels were developed and are being mined. No development work was required at the Hardy mine, although ore encountered below the mine workings was explored from the Boundary mine. Preparations were made for mining both the Boundary and Onaping orebodies. Longvack mine operated normally. The Fecunis Lake mine reached a high level of production during the year and was the Company's largest producer. At the Strathcona mine, a four-compartment shaft was commenced, and the collar poured. Facilities for sinking this shaft to 3,000 feet have been installed. Sinking was scheduled to commence during January 1961.

It is expected that the McKim, Longvack, and Emtwo mines will be exhausted during 1961. All of these were relatively small producers in 1960. The loss of ore deliveries from the closing of these mines will be made up from the other company mines.

Norduna Mines Limited

Deliveries of about 150,000 tons of somewhat higher-grade ore than that delivered in 1959 were made to Falconbridge from Norduna's Emtwo mine in 1960.

Treatment Plants

	1960	1959
Ore delivered to treatment plants.....tons	2,579,419	2,374,049
Ore milled to produce concentrate.....tons	2,362,463	2,005,374
Ore and concentrates smelted.....tons	591,190	658,432

For a number of years the company has been following a metallurgical program of increasing the removal of iron in the concentrating process rather than in the more costly smelting process. Progress in 1960 in this direction is indicated by the above figures. In 1960, 91 percent of ore

delivered to the treatment plants was milled as compared with 84 percent in 1959. Tonnage smelted was 10 percent less, but metals produced were about 10 percent more than in 1959. As part of this program additional milling equipment was and is being installed for concentration of the ores. Improvements in the sintering plant provided added capacity for agglomerating the increased volume of finely divided concentrate into acceptable furnace feed.

Ore Position

The total tonnage of ore reserves of the company at the end of 1960 was about the same as at the beginning of the year. Developed ore reserves decreased by about 1,250,000 tons, while indicated reserves showed an increase of about 1,150,000 tons.

The total nickel content of the reserves increased slightly, and the copper content decreased slightly. The 2,445,113 tons of ore hoisted from company mines during the year were effectively replaced in large part by an addition to the ore reserves of the Strathcona mine as a result of further drilling in that area. Development work permitted a reclassification of ore in the Boundary mine from the indicated to the developed category.

Summary of Ore Reserves at Year-End (Sudbury District)

	Ore	Nickel	Copper
Developed Ore:	tons	percent	percent
Falconbridge, East, McKim, Hardy, Fecunis, Longvack, Onaping, and Boundary	20,946,800	1.61	0.86
Indicated ore	25,142,300	1.33	0.77
Total	46,089,100	1.46	0.81

Research

Major research activity at Falconbridge continued to be related to the several phases of milling and concentration aimed at upgrading smelter feed and thereby reducing the tonnage to be smelted. A second major activity, related to the first, is an improvement of the process to treat the by-product pyrrhotite to recover the low nickel content and produce a high-grade iron ore product.

At the Metallurgical Laboratories, Richvale, emphasis on laterite ore treatment shifted from the laboratory stage to planning and engineering of the flow sheet to be used in a pilot treatment plant to be built in the Dominican Republic. Activity continued in mineralogical studies and in development of instrumental methods of analysis.

General

The mine rescue team from the Falconbridge mine were the winners of the Mine Rescue Trophy, open for competition to all mines in the Province of Ontario.

Fatima Mining Company Limited

Fatima Mining Company Limited was incorporated in May 1956, with an authorized capitalization of 5,000,000 shares of $1 par value, of which 3,000,005 shares have been issued. The directors and officers were: E. F. Carr, president and director; B. N. Apple, vice-president, secretary, and director; M. Osborne, treasurer and director; H. J. Lisack and E. S. Guilford, directors. The head office is at 25 Adelaide Street West, Toronto. The mine address is Box 285, Timmins.

The property consists of 26 claims, in Geikie and Bartlett townships, District of Timiskaming.

Operations continued from 1 January until 30 October 1960, on contract by Dravo of Canada Limited.

A vertical, three-compartment shaft was sunk 790 feet below the collar, on claim P.36102 in 1959. The 1st, 2nd, 3rd, 4th, and 5th levels were established at 150, 300, 450, 600, and 742 feet, respectively.

Development work in 1960 consisted of 2,892 feet of crosscutting and 250 feet of raising. Total development footage to 31 December 1960 was as follows: 1,550 feet of crosscutting on the 450-foot level; 1,450 feet of crosscutting and 250 feet of raising on the 742-foot level.

The average number of employees supplied by the contractor and mine was 18: 6 underground, and 12 on surface. E. F. Carr, president, was in charge at the property.

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. 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-treasurer; D. A. Foster, assistant secretary-treasurer. The head office is at 44 King Street West, Toronto. The mine address is Manitouwadge.

The company holds 57 claims in the Manitouwadge Lake area, District of Thunder Bay, 8 additional claims having been acquired for tailings disposal purposes in 1959.

Mining and milling continued throughout 1960.

SHAFTS, AT 31 DECEMBER 1960

Shaft	Claim No.	Inclination	Number of Compartments	Total Depth from Surface
				feet
No. 1	T.B.46849	Vertical	5	1,476
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

The 2,350-foot level was established and connected to No. 1 and No. 3 shafts.

The following development work was done during the year: drifting and crosscutting, 26,649 feet; raising, 6,397 feet. The total development footage to 31 December 1960, was as follows: 101,121 feet of drifts and crosscuts; 27,520 feet of raises. Diamond-drilling consisted of one hole, totalling 163 feet, from surface, and 448 holes from underground, totalling 97,749 feet.

New construction in 1960 included a mine-dry extension (25 x 37 ft.), a tailings booster station (24 x 40 ft.) an oil house (24 x 51 ft.), and a mine-air heating building (29 x 48 ft.).

New equipment added was as follows:

2 scrapers (72-in. Eimco, folding, Mine Equipment Co. Ltd.).
1 raising platform (Alimak, Mine Equipment).
1 storage tank (15,000-gal. capacity, Toronto Iron Works).
1 oil burner, mine-air heater (Calorific Limited).
4 cyclones (D10B Krebs, The Technequip Co. Ltd.).
2 portable mine power centres (Canadian Westinghouse).
1 ore-pocket level indicator (Electronic Associates Ltd.).

Annual Report

The following is taken from the mine manager's report for the year ending 31 December 1960:

Production

ORE MILLED	dry tons	1,294,077
Calculated Grade:		
Copper	percent	1.76
Zinc	percent	2.74
Silver	oz. per ton	1.36
Gold	oz. per ton	trace
COPPER CONCENTRATE PRODUCED	dry tons	77,424
Grade:		
Copper	percent	28.11
Silver	oz. per ton	17.97
Gold	oz. per ton	0.065
ZINC CONCENTRATE PRODUCED	dry tons	51,984
Grade:		
Zinc	percent	54.56

Copper concentrates produced were shipped to the Noranda smelter. Most of the zinc concentrates produced were shipped to a smelter in the United States, but some were stockpiled, and 7,184 dry tons were sold and shipped to Europe. At the end of the year the zinc concentrates stockpile amounted to 9,419 dry tons containing 10,330,682 pounds of zinc.

Milling

The mill operated for 95.40 percent of the total possible time during the year, and averaged 3,535 tons per day, the same as in 1959.

There were no metallurgical problems of any account, but research has resulted in improvement in grade of copper concentrate, improvement of zinc recovery, and reduction of moisture in both concentrates.

Metal recoveries for the year averaged:

	Percent
Copper	95.34
Silver	79.32
Zinc	80.10

Mining

Plans to extend the main No. 1 hoisting shaft to depth include: the development of this opening by pilot raising from No. 3 shaft workings, slashing of the pilot raise, and concreting to complete the project. Accordingly, the main development effort during the year was directed to completion of the six new levels from No. 3 shaft back to the No. 1 shaft location, and the excavation of the pilot raises. This horizontal work to join the two shafts was completed during 1960, and the pilot raising was 80 percent complete at the year's end. The raising portion of the program was seriously slowed by weak ground conditions. Total advance on all six new levels amounted to 15,700 feet. Preparations for slashing and concreting were largely complete at the end of the year, and this final phase should be underway by 1 February 1961. Pattern diamond-drilling to outline the lower extension of the orebody was completed from the same No. 3 shaft levels. This work confirmed the continuation of the ore zone as projected.

As part of the same depth program, the excavation for the third underground crusher station was well advanced. Ore passes, waste passes, and ventilation raises were advanced in the same area.

Comparatively minor amounts of horizontal development were carried out to the east on the upper levels of the mine, but the east limit of the ore zone has not been reached on any level.

The drive west on the 850-foot level was completed to the west boundary, and a preliminary diamond-drilling program was completed in the boundary area. Values were obtained in the favourable zone here, but they could not be considered commercial.

Underground work continued throughout the year on the extension of the fresh air and return air ventilation systems.

Stope preparation was completed earlier in the year for the lower B block of stopes and well advanced in the upper B block. A small amount of remnant preparation was carried out in the A block to the west, and preparation was also begun in the so-called C zone east of No. 1 shaft.

In the original A ore zone, two major pillar blasts were successfully undertaken, such that the open cut now extends to about 400 feet from surface. A large amount of waste sloughed from the walls and the east end of the open cut, but it is expected that broken ore recovery will be satisfactory. In the central section of the mine, called B zone, stoping was begun from four separate panels. Deterioration of the ground in this area resulted in a substantial reduction in

the rate of mining. During the year, primary stoping provided 43 percent of the mill feed, pillar mining 52 percent, and stope preparation the remaining 5 percent. About 147,000 tons of waste were hoisted, and 40,000 rockbolts were placed.

It has been decided to use conditioned mill tailings as mine back-fill, and underground work to implement this decision was begun during the year.

Again in 1960 very little underground equipment was added. However, due to the success of the original mechanical raise machine, a second unit was purchased and put into service.

Ore Reserves

The Geco orebody was originally divided into three zones, designated A, B, C, before the character of the deposit was fully known, and for convenience in mining layouts. This designation has caused some confusion since each is part of the same orebody. Consequently, this practice has been abandoned this year. Total reserves, therefore, are as follows:

	Ore	Copper	Zinc	Silver
	tons	percent	percent	ounces
Total and averages for 1960	17,429,000	1.97	4.18	2.20
Total and averages for 1959	16,042,500	1.94	4.33	2.21

Grades and tonnages quoted include an allowance for dilution of 10 percent.

The average number of employees was 535: 214 underground, and 321 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. Early in 1957 all issued preferred shares of stock were redeemed for cash, and all authorized but unissued preferred shares were cancelled. The authorized capitalization was 15,000,000 common shares of no par value, of which 14,584,025 had been issued. In April 1960, the authorized capitalization was increased to 36,000,000 shares of no par value on a two-for-one split; 29,196,118 shares have been issued.

The officers of the company in 1960 were as follows: H. S. Wingate, chairman and chief officer; J. R. Gordon, president; R. D. Parker, senior vice-president; R. H. Waddington, vice-president and general manager (Ontario division); W. A. McCadden, comptroller; W. F. Kennedy, secretary; F. M. A. Noblet, treasurer; Frederic Benard, T. M. Gaetz, and H. J. Mutz, assistant general managers (Ontario division); Alex Godfrey and G. A. Harcourt, assistants to vice-president; J. A. Piggott, manager of mines; R. R. Saddington, manager of reduction plants; W. R. Koth, manager (copper-refining division, Sudbury); W. J. Freeman, 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 at High Falls, Big Eddy, Wabageshik, and Nairn Falls; 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, West Virginia, U.S.A.; and Glasgow, Scotland; and a foundry at Bayonne, New Jersey, U.S.A. The development of a new nickel mining project at Thompson, Man., was in progress.

The company employed, in Ontario, excluding employees of contractors, an average of 19,339 persons: at mines, 7,047 underground and 2,044 on surface; at concentrators, smelters, refineries, and iron ore recovery plants, 10,248.

SHAFTS, INTERNATIONAL NICKEL COMPANY'S MINES, SUDBURY AREA

	Inclination	Number of Compartments	Sinking in 1960	Total Depth from Surface
CREAN HILL				feet
No. 1 shaft	57° to 305 ft. 71° to bottom	3	——	797
No. 2 shaft	Vertical	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-ft. depth)[1]	50°	5	——	2,702
No. 5 shaft	Vertical	6	——	4,074
No. 6 shaft (internal, collared at 3,822-ft. depth)	Vertical	5	——	5,562
No. 7 shaft	Vertical	3	——	2,056
No. 65 winze (collar 3,819-ft.depth)[2]	65°	3	——	4,320
No. 8 shaft (internal, collared at 5,017-ft. depth)	Vertical	3	398	6,749
FROOD-STOBIE				
No. 1 shaft[3]	77° to 1,300 ft. 61° to bottom	2	——	3,097
No. 3 shaft	Vertical	6	——	3,040
No. 4 shaft[4]	Vertical	3	——	3,928
No. 6 shaft (internal, collar at 2,872-ft. depth)	Vertical	3	——	3,391
No. 7 shaft	Vertical	5	——	3,105
No. 8 shaft	Vertical	3	133	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-ft. depth)	Vertical	2	57	4,057
LEVACK				
No. 1 shaft[2]	65°	3	——	983
No. 2 shaft	Vertical	6 to 2,915 ft. 4 to bottom	——	3,915
No. 3 shaft (internal, collared at 1,594-ft. depth)	Vertical	3	——	3,716
MURRAY				
No. 1 shaft[6]	36°	3	——	593
No. 1 winze (collar at 470-ft. depth)[6]	36°	2	——	775
No. 2 shaft	Vertical	5	——	3,298
VICTOR				
No. 1	Vertical	3	230	362
COPPER CLIFF NORTH				
No. 1	Vertical	5	50	50

[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 throughout the year.

Development work consisted of 8,913 feet of drifting and crosscutting, and 3,882 feet of raising. Total development footage to 31 December 1960 was as follows; 46,837 feet of drifts and crosscuts, 11,513 feet of raises. Diamond-drilling in 1960 consisted of 175 holes, totalling 99,273 feet, from underground, and 14 holes, totalling 3,297 feet, from surface.

Construction of a crushing plant, bins, and conveyor system in the open pit, and a feeder building and conveyor gallery on surface, commenced in 1959, was continued in 1960. New construction completed was as follows: crusher

house (45 x 24 x 30 ft.); conveyor gallery (134 x 11 x 9 ft.); concrete storage bin (42 ft. diam., 54 ft. high); conveyor housing on top of bin (24 x 26 x 18 ft.); conveyor tunnel (concrete, 112 x 13 x 11 ft.); water tank (wood-stave, 25.7 ft. diam., 20 ft. high).

New equipment added included the following:

2 locomotives (4-ton type, Goodman Mfg. Co.).
8 batteries (66 D8 cells, Amalgamated Electric Corp.).
1 boiler (LS-29 Scotch Dry Back, Dominion Bridge).
30 mine cars (110 cu. ft., Dorr-Oliver-Long).
2 hoists (H5NNIJ, Canadian Ingersoll-Rand).
1 welder (DRC Model SAE 400, Lincoln Electric).

The contractor employed an average of 123 men: 92 underground, and 31 on surface. J. McCreedy, assistant to the manager of mines, was in charge, and the company supplied a further 11 men.

CREIGHTON MINE

Operations continued throughout the year.

The No. 8 internal shaft, collared at 5,017 feet, was sunk a further 398 feet to a total depth of 6,749 feet below surface in 1960; the new 78 and 80 levels were established at 1,396 and 1,596 feet below the collar.

Development work during the year consisted of 12,130 feet of drifting and crosscutting; 3,872 feet of raising. Total development footage to 31 December 1960, was as follows: 399,033 feet of drifts and crosscuts; 198,839 feet of raises.

New equipment included the following: 2 skips (100-cu. ft., Dorr-Oliver-Long); 1 diamond-drill (J. V., Boyle Bros.); 2 pumps (BB4-7M, Boyle Bros.).

A total of 4,513,892 tons of ore was hoisted and shipped for treatment.

The average number of employees was 2,155: 1,630 underground, and 525 on surface. E. E. Mumford was superintendent.

FROOD-STOBIE MINE and FROOD OPEN PIT

Operations continued throughout the year.

No. 8 shaft was sunk a further 133 feet to a total depth of 2,624 feet below surface in 1960; the new 2,600-foot level was established.

Development work during the year consisted of 13,616 feet of drifting and crosscutting; 4,084 feet of raising. Total development footage to 31 December 1960, was as follows: 488,719 feet of drifts and crosscuts; 189,811 feet of raises. Some 88 diamond-drill holes, totalling 31,695 feet, were drilled from underground in 1960.

New equipment added included a jaw-crusher, (Traylor, 48 x 66 ft., Canadian Vickers Ltd.); a tipple unit (hydraulically operated, Dorr-Oliver-Long); a motor (300 hp., English Electric); 2 controllers (Lilly, Model C, Logan Engineering); 2 silicon rectifiers (Richardson Allen Model).

A total of 5,672,029 tons of ore was hoisted and shipped for further treatment.

The average number of employees was 2,921: 2,330 underground, and 591 on surface. S. J. Sheehan was superintendent.

A total of 732,681 tons of ore was mined in the open pit and trucked to the rockhouse.

The average number of employees was 172: 66 in the open pit, and 106 on surface. C. H. Stewart, assistant to the manager of mines, was in charge.

GARSON MINE

Operations continued throughout the year.

No. 3 vertical, two-compartment, internal shaft, collared at a depth of 4,000 feet, had been sunk 57 feet at the year's end.

Development work during the year consisted of 5,565 feet of drifting and crosscutting; 4,084 feet of raising. Total development footage to 31 December 1960, was as follows: 216,854 feet of drifts and crosscuts; 90,932 feet of raises. Some 158 diamond-drill holes, totalling 62,755 feet, were drilled from underground in 1960.

New equipment included:

A hoist (single-drum Pikrose, size 3, Peacock Bros.); a shaft mucker (Cryderman) and air hoist (Shaft Machines Ltd.); 3 diamond-drills and 3 pumps (Boyles Bros.); 14 hoists (Canadian Ingersoll-Rand).

A total of 1,150,248 tons of ore was hoisted and shipped for further treatment.

The average number of employees was 1,090: 905 underground, and 185 on surface. B. T. King was superintendent.

LEVACK MINE

Operations continued throughout the year.

Development work in 1960 consisted of 9,546 feet of drifting and crosscutting; 7,761 feet of raising. Total development footage to 31 December 1960, was as follows; 241,019 feet of drifts and crosscuts, 72,902 feet of raises. Some 218 diamond-drill holes, totalling 74,129 feet, were drilled from underground in 1960.

New equipment included the following:

10 mine cars (110 cu. ft., Dorr-Oliver-Long).
15 timber cars (3-ton, Robt. Hudson Ltd.).
1 mine hoist (45 x 30 ft., class SE. 1, Canadian Ingersoll-Rand Ltd.).
1 battery locomotive (4-ton, Goodman Mfg. Co.).
15 slusher hoists (Canadian Ingersoll-Rand Ltd.).
1 welder (Lincoln Electric).
2 diamond-drills (Boyles Bros.).

A total of 2,103,694 tons of ore was hoisted and shipped for further treatment.

The average number of employees was 2,043: 1,600 underground, and 443 on surface. F. M. McAteer was superintendent.

MURRAY MINE

Operations continued throughout the year.

Development work in 1960 included 11,847 feet of drifting and crosscutting; 2,410 feet of raising. Total development footage to 31 December 1960 was as follows: 165,503 feet of drifts and crosscuts, 35,905 feet of raises. Some 58 diamond-drill holes, totalling 29,907 feet, were drilled from underground, and 56 holes, totalling 13,772 feet, were drilled from surface in 1960.

New construction in 1960 included the following: a surface plant (245.5 x 37 x 27.5 ft.); a concrete storage bin below surface (100 x 33 x 37 ft.); a concrete water tank, (60 ft. diam., 15.5 ft. high); a pumphouse (24 x 20 x 15.5 ft. high).

Added equipment was as follows:

1 locomotive (8-ton, Goodman Mfg. Co.).
1 locomotive (4-ton, Goodman Mfg. Co.).
1 car shakeout (heavy duty, Hewitt Robins).
1 boiler (Scotch Dry Back, LS-86, Dominion Bridge).
16 slusher hoists (K5MNM26, Canadian Ingersoll-Rand).
20 mine cars (110 cu. ft., Dorr-Oliver-Long).

A total of 2,461,877 tons of ore was hoisted and shipped for further treatment.

The average number of employees was 660: 516 underground, and 144 on surface. H. W. Smith was superintendent.

VICTOR MINE

Operations were continued from 1 January to 6 December 1960.

The vertical, three-compartment, No. 1 shaft, commenced in 1959, was sunk a further 230 feet to a depth of 362 feet below surface. The first and second levels were established at depths of 154 and 237 feet below the collar.

A total of 164 feet of drifting and crosscutting and 136 feet of raising on the first level, and 476 feet of drifting and crosscutting and 256 feet of raising on the second level, was completed in 1960. Four diamond-drill holes, totalling 778 feet, were completed from underground.

A total of 134,077 tons of ore was hoisted and shipped for further treatment.

The average number of employees supplied by the contractor was 51: 26 underground, and 25 on surface. J. McCreedy, assistant to the manager of mines for International Nickel, was in charge.

ELLEN OPEN PIT

Work at the Ellen open pit in 1960 consisted of construction and installation of equipment, with J. McCreedy, assistant to the manager of mines, in charge.

New construction completed included the following: a crusher plant and bin (41 x 30 x 28 ft.); conveyor housing at head-end, (16 x 13.5 x 11 ft.); a conveyor (224 x 3 ft.) not housed; and a garage (79.3 x 37.5 x 21 ft.).

New equipment installed consisted of a transformer (1,500 kva., Maloney Electric); and a hoist (HU, Canadian Ingersoll-Rand).

CLARABELLE OPEN PIT

The Clarabelle open pit is located between Copper Cliff and the Murray mine. Stripping of a low-grade deposit began, preparatory to open-pit mining, under the direction of J. McCreedy, assistant to the manager of mines.

Work started on the construction of a primary crushing plant, a conveyor gallery, and a truck storage building.

COPPER CLIFF NORTH MINE

The sinking of the vertical, five-compartment, No. 1 shaft was commenced on contract. The dimensions inside the concrete lining will be 18 by 14.5 feet. A depth of 50 feet had been reached at the year's end; the objective is 3,000 feet.

Construction of a crushing plant, office, and warehouse was commenced. A transformer (1,500/2,000 kva, 6,900 volts, Maloney Electric) was installed.

The work was under the direction of J. McCreedy, assistant to the manager of mines.

LAWSON QUARRY

The quarry is operated to supply quartzite rock used as a flux in Sudbury smelting operations. The quarry address is Willisville.

New equipment added in 1960 consisted of a shovel (3-yard capacity, Bucyrus-Erie, Model 71B, Mussens Ltd.); and a portable air compressor (Model VTS-FD, Atlas Copco).

A total of 518,000 tons of quartzite was mined and delivered to the rockhouse; 515,550 tons was shipped.

The average number of employees was 39. W. G. Tilston was superintendent.

CREIGHTON MILL (CONCENTRATOR)

The Creighton mill treated 3,973,808 tons of ore, averaging 10,857 tons daily, to produce concentrates, which were pumped to the Copper Cliff smelter.

E. McMullen was superintendent.

COPPER CLIFF CONCENTRATOR

The Copper Cliff concentrator treated 9,579,765 tons of ore, averaging 26,174 tons daily, to produce concentrates.

New construction in 1960 consisted of an addition to the concentrator (110 x 42 x 37 ft.); a desliming plant (143 x 130 x 51 ft.); and a sand-fill storage shed comprising two drive houses (11.3 x 9.8 x 9 ft.), and an observation house (13.9 x 14.5 x 18.4 ft.).

New equipment installed included the following:

6 flotation machines (6-cell, No. 30, Denver Equipment).
2 vacuum pumps (29 x 29 x 10 in., VHEI, Canadian Ingersoll-Rand).
3 filters (Dorrco, 14 ft. diam., 16-ft. face, Dorr-Oliver-Long).
1 hoist (Shepard Niles heavy duty, 4,000 lb., J. H. Ryder Machinery).
2 motors (400 hp., English Electric).
2 motors (200 hp., English Electric).
2 motors (150 hp., Orenda Industrial).
3 pumps (14 x 12 in., SRL-C, Canadian Allis-Chalmers).

J. Lee was superintendent.

LEVACK MILL (CONCENTRATOR)

A total of 2,100,000 tons of ore was milled, at an average of 5,738 tons daily.

New equipment added included the following: 2 magnets (suspended, Memco, 30 inches wide, S.E.-1100, Madsom Corp.); 1 cyclone (Krebs, Model D-30-L, Technequip); 1 motor (100-hp., SC1, Tample Electric).

G. H. Morrison was superintendent.

CONISTON SMELTER

The Coniston smelter treated 467,427 tons of concentrate, producing 50,554 tons of bessemer matte.

New equipment installed included the following: 1 crane (overhead travelling, Munck electric 6-ton capacity, span 38.5 ft. Alliance Electric); 1 circuit breaker (2,000-amp., No. 2 size, Kingston, Lee Watson); 1 transformer (2,500 kva., 46,000/575 volts, Maloney Electric).

The average number of employees was 689.

F. G. Murphy was superintendent.

COPPER CLIFF SMELTER

The production from the smelter was 217,234 tons of nickel matte, 19,324 tons of nickel oxide sinter, and 159,216 tons of converter copper.

New construction consisted of the following: a fluid-bed roasting building (300 x 210 x 126 ft., 5 storeys); a cooling tower (23.5 x 21 x 25 ft.) and pumphouse (29 x 20 x 17 ft.); a flue (7-ft. diam., 800 ft. long, 30 ft. above grade); a brick storage building (350 x 80 x 31.8 ft.)

New equipment installed was as follows:

2 vacuum pumps (23 x 23 x 8, VHE-1, Canadian Ingersoll-Rand).
2 fans (vane-axial, 54-in., type 86 V, Sheldon's Engineering).
3 filters (Dorrco, 12.8 diam., 6-ft. face, Dorr-Oliver-Long).
3 rotary bin feeders (size 350, 50-ton capacity, Babcock-Wilcox-Goldie & McCulloch).
2 dust-handling systems (Fuller-Kinyon, National Materials Handling).
1 compressor (11.25 x 9 ins., class WG 9, Joy Mfg. Co.).
2 hoists (Shepard-Niles, 5 ton, J. H. Ryder Machinery).
3 elevators (Bocket, 30 tph., Rex Chainbelt Canada).
1 thickener (Dorr, type A, Dorr-Oliver-Long).
2 turbo mixers (54-in. quadruplex, Canadian Locomotive).
3 fans (83—5 Type, Canadian Blower & Forge).
1 filter (20,000-cfm. 4 CPT, No. 60 Mine Equipment).
2 air heaters (4,500,000 Btu. per hr., Calorific Ltd.).
1 scale (Howe special weigh bin, Eastern Scale Works).

3 coolers (rotary-drum, Link Belt).
1 service elevator (Otis Elevator).
1 blower (40,000 cfm., Brown Boveri).
20 ore cars (80-ton, Canadian Car Co.).
30 sand cars (75-ton, 3-hopper, Canadian Car Co.).
1 precipitator (Cottrell electric, Precipitation Co.).

The average number of employees was 6,053.

J. N. Lilley, superintendent of smelters, was in charge.

IRON ORE RECOVERY PLANT

The iron ore recovery plant produced 220,230 tons of iron ore, averaging 602 tons daily.

New equipment installed included the following:

2 heaters (Reznor direct-fired, 2,000,000 Btu. per hr., Calorific Ltd.).
1 drum (machet type 573, Jeffrey Mfg.).
1 vacuum pump (29 x 29 x 10, VHE-1, Canadian Ingersoll-Rand).
1 transformer (2,333/4,444 kva., type ONS/ONP, Canadian Westinghouse).
1 mixer (Lightning model 519 TELB-503, G. R. Ley Mixing Equipment).
1 aerator tank (14-ft. diam., 14 ft. high, Toronto Iron Works).
1 centrifugal pump (Worthite 4CNC-104, Worthington Canada).

The average number of employees was 391.

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 159,216 tons of converter copper, and 318 tons of scrap and secondary copper, were refined to produce 150,399 tons of refined copper.

New equipment added included a diesel-electric locomotive (10-ton, RSL-4 serial No. 127, Rogers Bros. Corp.); a furnace transformer (6,000 kva., type of W3 phase, McGraw-Edison Co.).

The average number of employees was 903.

W. R. Koth was manager.

PORT COLBORNE REFINERY

The Port Colborne refinery produces nickel cathodes, shot, ingots, and oxides; cobalt cathodes; and elemental sulphur.

The average number of employees was 2,212. W. J. Freeman was manager.

The following is taken from the company's annual report for the year ending 31 December 1960:

DELIVERIES OF METALS

	1960	1959	1958
Nickel:			
Nickel in refinery products ..... lb.	268,660,000	239,560,000	142,880,000
Nickel in rolling mill and foundry products .. lb.	78,490,000	73,350,000	59,670,000
Nickel in salts and chemicals ..... lb.	4,730,000	4,130,000	3,250,000
Total nickel in all forms ..... lb.	351,880,000	317,040,000	205,800,000
Copper ..... lb.	292,540,000	252,450,000	210,570,000
Cobalt ..... lb.	2,360,000	2,400,000	2,170,000
Platinum metals ..... oz.	359,300	384,600	145,400
Gold ..... oz.	50,100	36,300	44,000
Silver ..... oz.	1,510,000	1,200,000	1,155,000
Iron ore ..... long tons	192,000	162,000	122,000

SUDBURY DISTRICT MINES

All the company's producing mines operated at capacity throughout the year. Tonnage of total ore mined, the highest on record, is shown in the following table with the same data for the two previous years:

	Ore Mined		
	1960	1959	1958
	tons	tons	tons
Underground	16,036,000	13,798,000	8,863,000
Open pit	732,000	1,518,000	594,000
Total	16,768,000	15,316,000	9,457,000

At the year's end, underground development in the operating mines reached a cumulative total of 2,449,000 feet, or about 464 miles.

Development of a new mining operation, the Clarabelle open pit, was commenced during 1960. Located on an outcropping orebody in the Clarabelle and Lady MacDonald lakes area, the new open pit is situated southwest of Murray. Scheduled for production in 1961, this operation will replace a part of the tonnage now being obtained from other mines, including the Frood open pit where ore recovery from surface is approaching completion.

Development and surface construction at the Crean Hill mine was continued, with production planned to start early in 1961.

At several mines work was under way to provide access to lower horizons for deep-level exploration. At the Creighton mine one shaft reached a depth of 6,750 feet below surface, the company's deepest working. The shaft will serve as an airway in future deep mining at Creighton but will temporarily be used for development and initial ore production from the lower part of the mine.

Ore Reserves

The proven ore reserves at 31 December 1960, stood at 290,273,000 tons; this compares with 264,864,000 tons at the end of 1959. Nickel-copper content at the end of the year was 8,715,300 tons, compared with 7,964,900 tons at 31 December 1959.

Since the practice of annually reporting ore reserves was first adopted, the company has followed the consistent policy of reporting only proven ore reserves, that is, blocks of economic ore, which have been explored by drilling or otherwise, in sufficient detail and in accordance with the company's standard practice, to enable accurate calculation of the number of tons of ore and its nickel and copper content. This policy has been adhered to consistently without change, and this year's reserves are reported on the same basis.

For the first time, the ore-reserve statement reflects, on a basis consistent with the company's standard practice for calculating the presence of proven ore reserves, the inclusion of that part of the ores in the Thompson mine proven to-date, or 25,000,000 tons with a nickel-copper content of 742,500 tons. This addition to proven-ore reserves has been possible despite the fact that the major effort in Manitoba has been on preparing the Thompson mine for immediate production, and has not been concentrated on proving up as ore reserves the potential of ore in the Thompson mine or elsewhere in the Thompson–Moak Lake area.

Plant and Process Improvements

In the United Kingdom, the productive capacity of the Mond nickel refinery at Clydach was increased substantially as a result of plant modifications designed to take advantage of improved process techniques. At the Mond Acton refinery, alterations and additions to buildings provided increased platinum metals refining capacity and improved process efficiency.

In Ontario, construction went forward on the new plant at Copper Cliff for the fluid-bed roasting of nickel sulphide, which is expected to come into operation in 1961, and a number of plant and process improvements for increased efficiency were made. In the process research laboratories and pilot plants, the development of processes permitting improved recoveries and greater utilization of ores was under active investigation. Pilot-plant facilities were also being expanded.

At the year's end, preliminary work was commenced on a major expansion of the company's iron ore recovery plant at Copper Cliff, which will triple its capacity. In addition, larger quantities of nickeliferous pyrrhotite, which otherwise would have to be handled by the nickel section of the Copper Cliff smelter, will be diverted to the expanded iron ore recovery plant. This change

in practice in the nickel smelter will result in important smelting economies and will provide a basis for further major advances in nickel extractive metallurgy. Entailing an estimated capital outlay of $50,000,000, the expanded iron ore recovery plant is scheduled to be in full operation in 1963.

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 have been issued. The directors and officers were: A. W. White, president and director; G. A. MacMillan, vice-president and director; H. R. Heard secretary-treasurer and director; D. F. Burt, director. The head office is at 25 Adelaide Street West, Toronto. The mine address is Timmins, P.O. Box 290.

The property consists of 10 claims located in Robb township, Porcupine area, District of Cochrane, about 12 miles northwest of Timmins. Work by former operators consisted chiefly of an open-pit operation, with the material reported to contain copper. In 1950 and 1951, Hollinger Consolidated Gold Mines Limited conducted a gravity geophysical survey and did some diamond-drilling.

The company plans to commence mining operations in the open pit. Diamond-drilling in 1960 consisted of four holes, totalling 2,079 feet, from surface.

The complete mill of Nickel Rim Mines Limited, and the major part of the plant of Lake Cinch Mines Limited, North West Territories, was purchased and transferred to the property. New construction in 1960 included the following:

Office and warehouse (40 x 60 ft., steel frame, transitop siding).
Shop (50 x 85 ft., steel frame, transitop siding).
Garage (32 x 60 ft., prefabricated metal).
Dryhouse (25 x 60 ft., prefabricated plywood panel).
Mill building (120 x 160 ft., steel columns and trusses, plywood sheathing).
Crusher buildings (two 30 x 60 ft. each, frame timber and steel, plywood sheathing).
Switch room (15 x 40 ft., concrete block).
Water tank (50,000-gallon capacity, wood-stave construction).

The equipment necessary for the open-pit operation, plant, and mill had been purchased and was in the process of being installed, with production scheduled for 1961.

The average number of employees was 31. G. W. Walkey was mine manager.

Nickel Mining and Smelting Corporation Limited

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 to Nickel Mining and Smelting Corporation with the authorized capitalization in creased to 8,500,000 shares of no par value, of which 4,187,082 shares have been issued. The directors and officers were: A. W. Johnston, president; H. B. Hicks, vice-president and general manager; William McKee, secretary; T. J. Day, W. C. Campbell, Eliot Janeway, and Robert Lafleur, directors; W. M. O'Shaughnessy, treasurer. The head office is at 100 Adelaide Street West, Toronto 1. The mine address is Kenora, c/o Ontario Central Airlines.

The company owns the nickel-copper property known as the Gordon Lake mine, previously called the Quebec Nickel mine. The property, comprising 179 claims, is in the Werner Lake area, District of Kenora (Patricia Portion).

Operations continued throughout 1960.

SHAFTS, GORDON LAKE MINE

	Claim No.	Inclination	Number of Compartments	Total Depth from Surface
				feet
No. 1	K.R.L.19096	Vertical	3	360
No. 2	K.R.L.31831	Vertical	3	1,297
No. 3 (internal, collared at 1,200-ft. level	———	Vertical	2	1,683

No. 3 internal shaft collared on the 1,200-foot level was sunk 483 feet to a depth of 1,683 feet below surface. The 8th, 9th, and 10th levels were established at depths of 1,350, 1,500, and 1,650 feet, respectively. No. 2 shaft is about 2,500 feet west of No. 1 shaft and will be the production shaft.

Development footage in 1960 consisted of 3,744 feet of drifting, 950 feet of crosscutting, and 989 feet of raising. Total footage to 31 December 1960 was as follows: 13,313 feet of drifts; 6,850 feet of crosscuts; 1,486 feet of raises. Diamond-drilling in 1960 consisted of 166 holes, totalling 21,216 feet, from underground.

New equipment installed included two steam boilers (Volcano model G-25, 36 x 65 in.).

The average number of employees was 18: 4 underground, and 14 on surface. C. D. N. Taylor was mine manager.

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; J. A. H. Paterson, vice-president and director; R. C. Mott, Reginald Campbell, and N. C. Urquhart, directors; A. W. Coome, secretary-treasurer; T. R. Caldwell, assistant treasurer. The head office is at Room 1506, 44 King Street West, Toronto. The mine address is Box 353, Falconbridge.

The property, consisting of two claims located in Falconbridge and Kenogaming townships, District of Sudbury, is a short distance east of the Falconbridge plant.

Mining operations continued throughout the year through the No. 1, vertical, three-compartment shaft, sunk to a depth of 725 feet in 1957.

During the year, 171 feet of drifting, and 30 feet of crosscutting was completed. Total development footage to 31 December 1960 was as follows: 3,617 feet of drifts; 1,732 feet of crosscuts; 907 feet of raises. Diamond-drilling in 1960 consisted of 44 holes, totalling 1,796 feet, from underground and 5 holes, totalling 866 feet, from surface.

A total of 149,616 tons of ore was hoisted and delivered to the Falconbridge mill.

R. F. Fry and Associates contracted the mining work. The average number of employees was 40: 35 underground, and 5 on surface. R. C. Staveley was mine superintendent.

North Coldstream Mines Limited

Coldstream Copper Mines Limited was incorporated in November 1951, with an authorized capitalization of 3,000,000 shares of $1 par value. 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 had been issued to 31 December 1960. The directors and officers were: W. S. Row, president and director; E. T. Donaldson, L. J. Moreaux, R. V. Porritt, H. L. Roscoe, and N. C. Urquhart, directors; R. D. Stewart, secretary-treasurer; B. C. Bone, assistant secretary-treasurer. The head office is at 44 King Street West, Toronto. The mine address is Burchell Lake, Kashabowie P.O.

The property comprising 81 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 8½ miles by road south of Kashabowie station on the Canadian National railway.

Mining operations proceeded throughout 1960. The mill operated from 1 March to 31 December 1960.

SHAFTS, NORTH COLDSTREAM MINE

Shaft	Claim No.	Inclination	Number of Compartments	Sinking in 1960	Total Depth from Surface
				feet	feet
No. 1 shaft[1]	K.65	80°	2	——	200
No. 2 shaft[1]	K.65	Vertical	1	——	50
No. 3 shaft[1]	K.65	Vertical	1	——	20
No. 4 shaft	K.65	Vertical	3	54	1,596

[1]Sunk by former operators; not in use. Considerable lateral work was done from No. 1 shaft by former operators.

No. 4 shaft was deepened a further 54 feet in 1960, to a total depth of 1,596 feet below surface.

Development footage in 1960 consisted of 2,489 feet of drifting, 2,609 feet of crosscutting, and 2,697 feet of raising. Total development footage to 31 December 1960 was as follows: 9,830 feet of drifting; 6,353 feet of crosscutting; 7,238 feet of raising. Diamond-drilling in 1960 consisted of 114 holes totalling 19,150 feet, from underground, and 3 holes totalling 1,048 feet, from surface.

New equipment installed included the following:

1 2-compartment loading pocket (85 cu. ft., Dorr-Oliver-Long).
1 Denver cell, (No. 21, 6-cell, 38 by 38 inches, Nelson Machinery Co.).
1 tailings pump (25 hp., Canadian General Electric).
3 Pyronal transformers (150-volt).
1 load break switch (S. & C.).
3 circuit breakers (Canadian General Electric).

A total of 266,154 tons of ore was hoisted and treated in the mill, which averaged 870 tons daily.

The average number of employees was 194: 92 underground, and 102 on surface. L. F. Redford was manager.

Rio Algom Mines Limited
(Pronto Division, Pater Mine)

In June 1960, Pronto Uranium Mines Limited, which included 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 (*see* page 133).

The company's main property consists of 22 claims, and 10 lots known as the McFadden Option, in Spragge township, District of Algoma. A vertical, three-compartment shaft was sunk in 1956 on the southeast quarter of section 29, Spragge township. Levels had been established at 200-, 350-, 500-, 650-, 800-, and 950-foot depths, and some lateral development had been completed before operations were terminated on 15 June 1957.

Operations were resumed on 26 January 1960 and were continuing at the year's end.

The workings were dewatered, and the shaft was deepened 94 feet to a total depth of 1,126 feet below surface.

Development work in 1960 consisted of 4,097 feet of drifting, 942 feet of crosscutting, and 6,818 feet of raising. Total development footage to 31 December 1960 was as follows: drifts, 5,034 feet; crosscuts, 1,820 feet; raises, 6,863 feet. Diamond-drilling in 1960 consisted of 7 holes, totalling 4,249 feet, from underground.

New construction included a hoist and compressor house (40 by 81.6 ft.) a reinforced headframe (77.1 ft., collar to sheave); a service and dry building (30 x 60 ft.); a siding ramp (25 x 10 ft.); ore bin enclosure (20 x 20 ft.); a pumphouse (7.5 x 15 ft.); a conveyorway (247.3 x 3 ft., with 7- x 9-ft. gallery); and a concentrate loading ramp (16.2 x 40.2 ft.).

Equipment added included the following:

1 hoist (42- x 42-in., double-drum, P.E.I., Canadian Ingersoll-Rand).
1 hoist (100- x 54-in., double-drum, P.E.I., 500-hp. motor, Canadian Ingersoll-Rand).
1 ore bin (steel, 20-ft. diameter).
2 compressors (XVHE, 1,500 cfm.).
1 compressor (500-cfm. with 100-hp. motor).
1 concentrator boiler (Titusville, SCH-103).
1 flotation machine (sub A No. 24, dual model AISS).
1 filter (8.9 x 8 ft., Emico neutral disc).
6 Dorrclones (1 foot diameter x 20 ft.).

A total of 34,251 tons of ore was hoisted and stockpiled.

The following, pertaining to the Pater operation, is taken from the company's annual report for the year ending 31 December 1960:

> With the suspension of mining operations at Pronto it was decided to retain as many of the personnel as could be employed and bring the copper orebody at the Pater mine into production at the beginning of 1961, earlier than was originally planned. This has been done.
>
> The latter part of 1960 was devoted to converting the Pronto plant for receiving and milling copper ore. Ultimate milling rate is to be 750 tons per day. The Pronto hoist, compressor, and other equipment were installed at the new location. Some building construction at the Pater shaft was entailed, but was held to a minimum.
>
> Ore at Pater indicated by drilling and development is 1,032,503 tons grading 1.845 percent copper per ton after 10-percent dilution at 0.50 percent grade.

The average number of employees was 49: 32 underground, and 17 on surface. P. E. Young was mine manager.

Sherbrooke Metallurgical Company Limited

Sherbrooke Metallurgical Company Limited was incorporated in May 1959, with an authorized capitalization of 3,000 preferred shares of $10 par value and 10,000 common shares of no par value, of which all the 10,000 common shares

have been issued. The directors and officers were: H. D. Carus, president and director; C. R. MacBrayne, vice-president and director; R. J. Bennett, secretary-treasurer and managing director; J. A. Battle, A. C. Carus, E. H. Carus, D. B. Lourie, and H. A. Gronemeyer, directors; W. F. Schoening, assistant treasurer; Laura E. Hughett, assistant secretary. The head office and plant are at Port Maitland, P.O. Box 800, Dunnville.

Completion of the new metallurgical plant near Dunnville, late in 1960, will permit the roasting of zinc sulphide concentrates from Canadian and other mines, and the burning of elemental sulphur for a production of 450 tons per day of sulphuric acid. The burning of elemental sulphur has been the initial source of sulphur dioxide for sulphuric acid production, but its main purpose is to augment the gas emanating from the roasters. The roasted product will be processed elsewhere in a smelter. This is the first plant in North America to use a pelletized fluid hearth process using zinc sulphide concentrates.

Zinc concentrates arrive at the Sherbrooke plant in railway cars. They are placed in a thaw house, sampled, and then unloaded on asphalt pads. The sulphides are then directed through a rotary dryer where the moisture is reduced to about 2 percent. Additions of bentonite and other fine materials are added to the concentrates, preparatory to mixing in a pug mill and pelletizing. The pellets are dried on grates, screened, and fed to the roasters, which remove the sulphur from the sulphides, and also part of the lead, zinc, and cadmium. The pellets are cooled and conveyed into elevated bins for shipping. The sulphur dioxide gas from the roasters is substantially cooled and purified by means of cyclones, a dust precipitator, a scrubber, and a mist precipitator. It is then fed into the acid plant where it is made into sulphuric acid.

Acid production, process and plant heat will be delivered to nearby plants. An increase in the demand may necessitate additional expansion of plant facilities.

The average number of employees was eight. R. J. Bennett was managing director.

Temagami Mining Company Limited

Temagami Mining Company Limited was incorporated in August 1954. It is an amalgamation of Temagami Mining Company and Derosier Nickel and Copper Mines. The authorized capitalization is 5,000,000 shares of $1 par value, of which 2,990,267 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; J. C. Perry, director; R. A. Cranston, assistant-secretary. The head office is at 11 Adelaide Street West, Toronto. The mine address is Timagami.

The company's holdings consist of 173 claims in Phyllis, Briggs, Joan, Yates, and Scholes townships, Timagami area, District of Nipissing.

The vertical, four-compartment No. 1 shaft, located in Phyllis township on mining lease No. 11446, is 880 feet deep with levels at 400, 525, and 825 feet.

Mining operations continued throughout 1960.

Development footage in 1960 consisted of 1,428 feet of drifting, 380 feet of crosscutting, and 520 feet of raising. Total development footage to 31 December, 1960 was as follows: 13,559 feet of drifting, 6,586 feet of crosscutting, and 2,661 feet of raising. Diamond-drilling in 1960 consisted of 342 holes, totalling 46,092 feet, from underground and 26 holes, totalling 6,477 feet, from surface.

New construction consisted of an addition to the crusher building (28 x 16 ft., 20 ft. high, cement-block construction).

New equipment added included one cone-crusher (Symons, 3-ft. standard) and eight flotation cells (Denver No. 18 special).

A total of 54,473 tons was hoisted, of which 14,482 tons was discarded. The mill treated 49,850 tons of ore, averaging 137 tons daily.

The following is taken from the mine manager's report for the year ending 30 June 1960:

Mining

Mining operations were carried on in Nos. 1 and 2 open pits, and No. 4, No. 5, No. 6, No.7, and No. 8 orebodies. Mining was completed in No. 1 and No. 7 orebodies, and broken ore was left in No. 7 stope as a reserve. Preparations for stoping No. 9 orebody were partly completed.

Milling

The mill treated a total of 45,509 tons grading 6.16 percent copper for the year.
Contained metals in 10,384 tons of concentrates shipped:

Copper	pounds	5,475,682
Gold	ounces	890.43
Silver	ounces	18,437.94

Additional flotation capacity was added to enable the mill to handle higher grades of ore.

SHIPMENTS OF CONCENTRATES AND DEVELOPMENT ORE TO 30 JUNE 1960

Year Ending	Tonnage	Copper	Gold	Silver
	dry tons	percent	oz. per ton	oz. per ton
30 June 1956	7,019	23.3	0.09	0.86
30 June 1957	7,509	25.4	0.11	0.78
30 June 1958	4,553	23.9	0.10	1.54
30 June 1959	2,979	23.5	0.10	1.50
30 June 1960[1]	14,346	24.9	0.08	1.62
Total and averages	36,406	24.2	0.10	1.26

[1] Concentrates ..... 10,384 tons.
Crude ore ..... 3,962 tons.

Ore Reserves

As of 30 June 1960 the high-grade copper reserves were:

	In Place	Grade Copper	Broken	Grade Copper
	tons	percent	tons	percent
Surface stockpiles	———	———	5,733	6.0
No. 2 orebody	7,904	9.1	145	9.1
No. 3 orebody	15,050	11.0	———	———
No. 4 orebody	7,500	12.0	———	———
No. 5 orebody	500	5.0	———	———
No. 6 orebody	54,000	8.0	5,503	6.0
No. 7 orebody	———	———	2,833	5.0
No. 8 orebody	———	———	500	3.0
No. 9 orebody	3,000	10.0	———	———
No. 10 zone	1,000	8.0	———	———
Total	98,954	8.8	14,714	5.7

Total ore reserves, 113,668 tons of 8.4 percent copper.

The average number of employees was 126: 46 underground, and 80 on surface. W. P. Houston was mine manager, and E. D. Quantz assistant mine manager.

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 3,944,105 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. The mine address is Manitouwadge.

The company holds 30 claims in Gemmell and Mapledoram townships, Manitouwadge Lake area, District of Thunder Bay, in the Port Arthur Mining Division, adjoining the west boundary of the Geco property.

Operations continued throughout 1960.

SHAFTS, WILLROY MINE

	Claim No.	Inclination	Number of Compartments	Sinking in 1960	Total Depth from Surface
				feet	feet
No. 1	T.B.46933	Vertical	4	268	1,830
No. 2	T.B.46938	Vertical	4	——	530

No. 1 shaft was sunk 268 feet to a total depth of 1,830 feet below surface. New levels established were the 10th and 11th, at 1,589 and 1,743 feet, respectively, below the shaft collar.

The following development work was done during the year: drifting, 4,266 feet; crosscutting, 1,158 feet; and raising, 4,869 feet. The total development footage to 31 December 1960 was as follows: 19,720 feet of drifts; 9,750 feet of crosscuts; 14,619 feet of raises; all between the first and eighth levels. Diamond-drilling consisted of 572 holes, totalling 40,377 feet, from underground.

New construction included a steel-clad mill warehouse and reagent storage building (40- x 100 feet, Atkinson).

The following new plant equipment was added:

1 tractor shovel (Michigan Model 75G).
2 steam generators for plant heating (Chromolax, 3-phase, 60-cycle, 75-bhp.).
1 trammer (Mancha, with battery boxes and storage battery).
4 mine cars (70 cu. ft., Granby).
1 shaft mucker (Cryderman).
1 rocker shovel (Eimco Model 630).

A total of 429,455 tons of ore was hoisted; 429,309 tons was milled. The mill treated an average of 1,173 tons daily.

The following is taken from the manager's report for the year ending 31 December 1960:

Mining

The long-hole benching method was continued throughout the year in all ore zones. Hanging-wall weakness has caused some dilution of No. 3 zone ore, but this tendency has been counteracted by rockbolting and random pillars.

Mining in the No. 6 zone was started during the year, but stoping objectives were never reached due to the complex and irregular nature of the zone in such areas as were developed. Nevertheless, 51,000 tons of ore were drawn, running 2.41 percent copper and 0.95 ounces silver per ton, which is somewhat better grade than was anticipated.

Costs

The unit costs were reduced from $5.42 per ton in 1959 to $5.15 in 1960. Development costs were down. Mining costs were up, due to a program of increased stope preparation to meet the raised tonnage objectives. Remaining costs declined with the higher divisor.

	Cost Per Ton Milled	
	1960	1959
Exploration and development	$0.31	$0.76
Mining	2.44	2.06
Milling	1.54	1.64
Administrative and general	0.86	0.96
Total	$5.15	$5.42

Milling

Metallurgically, the year under review was noteworthy for a marked gain in copper recovery (79.9 to 86.5 percent). This was effected by two mill changes. First, four flotation cells formerly used as zinc precleaners were re-piped to act as copper scavengers, and second, the regrind mill installed late in 1959 was placed in the circuit to regrind copper cleaner tails.

Lower zinc heads brought recovery of this metal slightly lower, whereas lead heads reached the point where the value of making any lead separation became questionable. There was some gain in silver recovery. Average results, as compared to 1959 performances, are shown below:

AVERAGE RECOVERY, 1960

Average daily tonnage 1,173
Mill running time ..... percent of total 94.20

	Assays				Recoveries			
	Ag	Cu	Pb	Zn	Ag	Cu	Pb	Zn
Heads	2.16	1.24	0.22	7.39	100.0	100.0	100.0	100.0
Cu concentrate	26.35	23.10	0.54	7.24	55.3	84.3	11.2	4.4
Pb concentrate	55.24	6.99	42.78	7.07	9.9	2.2	74.8	0.4
Zn concentrate	1.56	0.64	0.09	55.15	8.5	6.1	4.7	88.2
Tails	0.68	0.11	0.02	0.62	26.3	7.4	9.3	7.0
Payable Recoveries					65.2	86.5	74.8	88.2

AVERAGE RECOVERY, 1959

Average daily tonnage 1,017
Mill running time ..... percent of total 97.12

	Assays				Recoveries			
	Ag	Cu	Pb	Zn	Ag	Cu	Pb	Zn
Heads	3.72	0.99	0.57	9.93	100.0	100.0	100.0	100.0
Cu concentrate	52.44	21.84	0.79	9.94	48.0	75.3	4.7	3.4
Pb concentrate	62.23	4.91	50.59	7.30	15.5	4.6	82.4	0.7
Zn concentrate	1.79	0.61	0.16	55.92	7.6	9.7	4.4	88.9
Tails	1.34	0.13	0.06	0.87	28.9	10.4	8.5	7.0
Payable Recoveries					63.5	79.9	82.4	88.9

Ore Reserves

As of 1 January 1961, the total of broken, proven, and indicated reserves stood at 2,709,000 tons as detailed below:

Zone	Tonnage	Copper	Zinc	Lead	Silver
		percent	percent	percent	ounces
1	535,856	1.42	0.37	trace	0.43
2	79,148	0.02	5.33	trace	0.43
3	1,576,475	2.07	7.20	0.13	1.96
4	51,934	0.05	7.14	1.05	4.48
5	76,067	0.03	7.46	0.12	2.06
6	389,520	2.27	0.59	trace	0.61
Total or Average	2,709,000	1.81	4.85	0.10	1.47

General

Copper concentrates produced during the year were shipped to Noranda, Que., and lead concentrates to East Helena, Montana, U.S.A. Zincs went to Port Maitland, as well as to La Salle, Josephtown, and Galena in the United States. No shipments were made to Europe.

The average number of employees was 232: 101 underground, and 131 on surface. R. S. Haflidson was manager.

PLATINUM METALS—*see* NICKEL AND COPPER

PYRRHOTITE—*see* NICKEL AND COPPER

SELENIUM—*see* NICKEL AND COPPER

SILVER AND COBALT

In 1960 the mines of the Cobalt and Gowganda areas shipped 5,225 tons of concentrates to the refineries of Deloro Smelting and Refining Company Limited and Noranda Mines Limited, and 589 tons of concentrates were shipped to refineries in the United States. From this material, totalling 5,814 tons, 7,155,909 ounces of silver were recovered. In the nickel-copper refining processes, 1,665,314 ounces were recovered. The base metal mines recovered 1,956,971 ounces; and the gold mines recovered 442,629 ounces. The province's total silver production by ounces increased by 6.45 percent. The value of the silver produced increased 7.82 percent.

The Deloro Smelting and Refining Company Limited reported the recovery of 339,324 pounds of cobalt in the form of metal and salts from concentrates shipped from the Cobalt-Gowganda area. In the nickel-copper refining processes 2,919,077 pounds were recovered. The total of 3,258,401 pounds was an increase of 14.91 percent over the 1959 production. The value showed an increase of 16.60 percent.

The mines of the Cobalt-Gowganda area and the Deloro refinery employed 123 salaried personnel and 573 wage-earners. They paid the former $572,016 and the latter $2,136,315. Fuel and electricity used cost $385,998, and process supplies used cost $674,097.

Silver Production

Source		1956	1957	1958	1959	1960
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. $	4,721,556 4,234,291	4,316,480 3,771,309	6,043,502 5,257,847	6,657,162 5,843,657	7,155,909 6,362,319
In crude gold bullion.	oz. $	408,997 364,776	425,875 368,451	442,249 380,951	408,114 358,242	442,629 393,541
Recovery for nickel-copper refineries.	oz. $	1,391,545 1,247,938	1,575,138 1,376,188	1,217,510 1,056,920	1,384,223 1,215,071	1,665,314 1,480,631
In copper-gold-silver ores.	oz. $	12,215 10,955	17,056 14,968	—— ——	—— ——	—— ——
In silver-lead-zinc-copper ores.	oz. $	92,134 82,626	575,581 503,682	—— ——	—— ——	—— ——
Base metal mines.	oz. $	—— ——	—— ——	2,111,996 1,833,424	2,091,357 1,835,793	1,956,971 1,739,943
Total Production	oz.	6,626,447	6,910,130	9,815,257	10,540,856	11,220,823
Total Value	$	5,940,586	6,034,598	8,529,142	9,252,763	9,976,434

Shipments from Silver Mines, Smelters, and Refineries

Year		Bismuth	Copper	Lead	Nickel	Cobalt	Arsenic	Silver	Total
1904–55	tons	113	1,149	373	7,435	20,011	82,325	oz. 465,493,000	——
	$	251,791	380,497	33,718	2,527,386	43,012,091	6,790,659	283,681,308	336,677,450
1956	tons	3	265	12	305	629	895	oz. 4,722,000	——
	$	10,586	219,100	2,991	570,690	3,261,783	77,612	4,234,291	8,377,053
1957	tons	7	228	27	218	669	1,848	oz. 4,316,000	——
	$	21,372	131,927	5,589	531,077	2,647,917	137,112	3,771,309	7,246,303
1958	tons	9	113	34	79	379	1,162	oz. 6,043,000	——
	$	26,779	57,340	4,661	119,896	1,506,783	94,542	5,257,847	7,067,848
1959	tons	16	92	63	89	277	789	oz. 6,657,000	——
	$	37,748	46,913	8,559	133,562	962,653	63,786	5,843,657	7,096,878
1960	tons	19	136	74	64	170	862	oz. 7,155,909	——
	$	45,402	82,304	12,297	130,467	616,713	70,400	6,362,319	7,319,902
Totals	tons	167	1,983	583	8,190	22,135	87,881	oz. 494,386,909	——
	$	393,678	918,081	67,815	4,013,078	52,007,940	7,234,111	309,150,731	373,785,434

Agnico Mines Limited

Cobalt Consolidated Mining Corporation Limited was incorporated in January 1953 with an authorized capitalization of 3,500,000 shares of $1 par value. 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 2,157,327 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; J. B. Lynch, 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, Timagami area, District of Nipissing.

All mining operations in 1960 were confined to the company's properties in the Cobalt area.

AGAUNICO MINE

Operations at the Agaunico property continued from 1 January to 29 February 1960.

SHAFTS, AGAUNICO MINE

	Claim No.	Inclination	Number of Compartments	Depth from Surface
				feet
No. 1 shaft	Parcel 195	Vertical	2	400
No. 2 winze (below 275-foot level)	697	Vertical	2	458
No. 1 incline haulageway (below 275-foot level)	697	20°	2	325

There was no development work completed in 1960. The following table gives the total development footages as of 29 February 1960:

DEVELOPMENT FOOTAGE, AGAUNICO MINE

Level	Total Drifts	Total Crosscuts	Total Raises
	feet	feet	feet
200-foot	2,397	489	1,660
275-foot	5,512	1,627	1,852
325-foot	684	232	——
375-foot	241	155	118
450-foot	541	731	——

Some 34 diamond-drill holes were completed in 1960, totalling 7,413 feet, from underground.

A total of 5,223 tons of ore was hoisted; 9,667 tons was milled.

CHRISTOPHER MINE

The Christopher mine adjoins the south boundary of the Cobalt Lode mine, in lot 2, concession III, Coleman township. The operation continued throughout 1960, under lease from Christopher Silver Mines Limited.

SHAFTS, CHRISTOPHER MINE

	Claim No.	Inclination	Number of Compartments	Depth from Surface
				feet
No. 1 shaft	1970	Vertical	2	295
No. 2 shaft	106	Vertical	2	415

These shafts are not used in the present operation. There is a connection between the Christopher workings and the Cobalt Lode workings on the 400- and 600-foot levels. The Brady Lake No. 4 shaft was leased from Silver-Miller Mines to permit access, via a winze from the 600-foot level, to deep ore on Christopher ground. Ore was hoisted up all three shafts. The 310-, 500-, and 725-foot levels were established.

Development work during the year consisted of 2,208 feet of drifting, 433 feet of crosscutting, and 1,347 feet of raising. Total development footage to 31 December 1960 was as follows: 8,880 feet of drifts; 2,828 feet of crosscuts; 7,929 feet of raises. Diamond-drilling in 1960 consisted of 36 holes, totalling 3,852 feet, from underground.

New construction in 1960 included the following: a hoist room (24 x 30 ft.); a machine shop (24 x 30 ft.); mine bins (17 x 15 ft.); a boiler room (20 x 25 ft.); a water tank (20 x 20 ft.); a transformer house (10 x 13 ft.); a headframe raised to 60 feet; all construction lumber and mine siding.

Equipment installed consisted of the following:

1 hoist (double-drum, 45 x 24, Canadian Ingersoll-Rand).
1 motor for hoist (75-hp., Westinghouse).
3 transformers (40 kva., 2,200/550 volts) and accessories in substation.
1 control panel and accessories.
1 heating boiler (low-pressure).

A total of 50,974 tons of ore was hoisted; 50,898 tons was milled.

FOSTER MINE

The Foster, Crown Reserve, Kerr Lake, and Penn-Canadian mines are part of a group, in lots 3 and 4, concession IV, Coleman township, held under lease from Penn-Cobalt Silver Mines Limited.

The Foster property was operated from January to May 1960 on a salvage basis.

SHAFTS, FOSTER MINE

	Claim No.	Inclination	Number of Compartments	Depth from Surface
				feet
No. 1 shaft	66	Vertical	2	55
No. 2 shaft	66	Vertical	2	69
No. 3 shaft	66	Vertical	2	115
Air shaft	66	Vertical	2	80
No. 5 shaft	66	Vertical	3	225
No. 6 shaft	66	Vertical	2	88

There was no development work completed in 1960. The total development footage on the 70, 140, and 210-foot levels at 31 December 1960, was as follows: drifting and subdrifting, 4,587 feet; crosscutting, 1,840 feet; raising, 3,103 feet. Some 30 diamond-drill holes, totalling 1,378 feet, were completed in 1960, from underground.

A total of 917 tons of ore was hoisted; 833 tons was milled.

NIPISSING MINE

Development work in 1960 consisted of diamond-drilling only. Some 41 holes, totalling 9,706 feet, were completed during the latter part of the year from underground.

O'BRIEN MINE

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 throughout 1960.

SHAFTS, O'BRIEN MINE

	Location	Inclination	Number of Compartments	Depth from Surface
				feet
Main shaft	R.L.403	Vertical	3	345
No. 615 winze (below 340-foot level)	R.L.403	Vertical	2	460
No. 2 shaft	R.L.403	Vertical	2	250
No. 6 shaft	R.L.403	Vertical	2	300
No. 14 shaft	R.L.403	Vertical	2	176

Operations are carried on through the main shaft to the 340-foot level, and No. 615 winze to the 460-foot level.

Development work in 1960 consisted of 715 feet of drifting, 1,111 feet of subdrifting; and 1,217 feet of raising. Total development footage to 31 December 1960 was as follows: 6,372 feet of drifts, 1,883 feet of subdrifts, 1,955 feet of crosscuts, 6,286 feet of raises. Some 253 diamond-drill holes, totalling 26,806 feet, were completed in 1960 from underground.

A total of 30,118 tons of ore was hoisted; 33,810 tons was milled.

PENN MILL (FOSTER PROPERTY)

The Penn mill operated throughout the year, treating ore from the four producing mines.

New construction included a scale house (16 x 26 ft.); blacksmith shop (12 x 20 ft.); and a sample crusher building (8 x 12 ft.).

A set of scales (25-ton capacity) and a sample crusher (8 x 10 ins., capacity 1.5 tph.) were added equipment.

The mill treated a total of 95,940 tons, averaging 305 tons daily.

The average number of employees at all operations was 168: 97 underground, and 71 on surface. H. E. Cawley was manager.

Cairngorm Mines Limited

Cairngorm Mines Limited was incorporated in November 1955, with an authorized capitalization of 4,000,000 shares of no par value, of which 1,440,006 shares have been issued. The directors and officers were: L. M. Ireland, president

and director; M. P. Salmon, vice-president and director; S. A. McWilliams, L. F. Mendendorp, and D. M. Green, directors; D. I. McWilliams, secretary; P. K. E. McWilliams, treasurer. The head office is at 220 Cottingham Street, Toronto 7. The mine address is 240 South High Street, Port Arthur.

The property consists of 1,522 acres, in O'Connor, Scoble, Paipoonge, and Gillies townships, District of Thunder Bay; it includes the old Beaver mine, located about 26 miles south of Port Arthur.

SHAFTS, CAIRNGORM MINE

	Location	Inclination	Number of Compartments	Total Depth
				feet
No. 1	Mining Location 97T	75°	2	150
No. 2	Mining Location 97T	75°	2	420
Old winze	———	75°	2	115

Work completed in 1960 consisted of diamond-drilling; 11 holes, totalling 1,345 feet, were completed from underground, and 8 holes, totalling 1,175 feet, were completed from surface.

D. B. McWilliams was general manager, A. W. Grant was superintendent, and three men were employed.

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, 3,335,005 shares have been issued. The directors and officers were: Denison Denny, president and managing director; J. G. Pierdon, vice-president and director; P. H. Chubb and J. D. Smith, directors; Lawrence Murphy, treasurer; Margaret B. Smith, secretary. The head office is at 100 Adelaide Street West, Toronto 1. The mine address is Cobalt.

Deer Horn Mines Limited leased the Cross Lake O'Brien property from Agnico Mines Limited. The property consists of 14 claims in Coleman township, District of Timiskaming, about 1½ miles east of Cobalt.

The mine operated from 3 January to 31 December 1960; the mill operated from 2 June to 23 December 1960.

The main shaft is 595 feet deep; there are two winzes, one of which extends to a depth of 800 feet below surface.

The shaft was dewatered to the 450-foot level in early 1959. No. 2 winze was dewatered to the 800-foot level in 1960. A total of 870 feet of drifting, 392 feet of crosscutting, and 768 feet of raising was completed in 1960. Total development footage by Deer Horn Mines to 31 December 1960 was as follows: 1,044 feet of drifts, 578 feet of crosscuts, 879 feet of raises. Some 156 diamond-drill holes, totalling 19,786 feet, were drilled from underground.

New construction included a mine dry and engineering office (50- x 30- x 12-ft. high, frame construction with concrete floor).

The former Nipissing O'Brien mill, a concentrator (100-ton per day) comprising crushing, grinding, gravity, and flotation concentration, was used.

A total of 13,714 tons of ore was hoisted: 2,621 tons was discarded; 13,996 tons was milled during the period of operation.

The average number of employees was 41: 21 underground, and 20 on surface. J. E. Armstrong was mine manager, and H. G. Neilson was mill superintendent.

Deloro Smelting and Refining Company Limited

The Deloro Smelting and Refining Company Limited was incorporated under Dominion charter in July 1916. In November 1936 it was converted into a private company by supplementary letters patent, with an authorized capitalization of 15,000 shares of $85 par value, of which, 11,900 shares have been issued. The directors and officers were: B. A. O'Brien, president; Alan Scott, vice-president; R. F. Burns, secretary-treasurer; P. E. Fleming, assistant secretary-treasurer. The head office address is 340 Wellington Street, Ottawa. The plant is at Deloro.

Operations continued throughout 1960.

The average number of employees was 181. J. N. Cram was resident manager.

Dolphin-Miller Mines Limited

Dolphin-Miller Mines Limited was incorporated in 1944, with an authorized capitalization of 3,000,000 shares of $1 par value, of which 2,398,673 shares have been issued. The directors and officers were: P. J. Sullivan, president and director; H. G. Miller, vice-president and director; D. B. Cowie, W. A. Edmond, and R. A. Gareau, directors; L. V. Barbisan, secretary-treasurer. The head office is at 25 Adelaide Street West, Toronto. The mine address is Box 870, New Liskeard.

The property comprises 10 claims in Harris township, District of Timiskaming.

There is a vertical, two-compartment shaft, 370 feet deep located on the southwest quarter of the north half of lot 5, concession VI, Harris township. Two levels had been established at 220 and 360 feet, on which 190 and 340 feet, respectively, of crosscuts had been completed previously.

Work in 1960 included the completion of 14 diamond-drill holes, totalling 5,377 feet, from surface.

The work was under the direction of J. E. Jerome, consulting engineer.

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 May 1957 the capitalization was increased to 5,000,000 shares of $1 par value, of which 3,800,015 shares have been issued. The directors and officers were: A. W. White, president and director; D. F. Burt, vice-president and director; H. R. Heard, secretary-treasurer and director; K. J. Benner and J. E. Armstrong, directors. The head office is at 145 Yonge Street, Toronto. The mine address is New Liskeard.

The property consists of 20 claims in Casey and Harris townships, District of Timiskaming, and includes the former Casey Cobalt property.

Mining and milling operations continued throughout 1960.

SHAFTS, CASEY COBALT PROPERTY

	Claim No.	Inclination	Number of Compartments	Total Depth from Surface
				feet
No. 1 shaft (inactive)	T.354	75°	2	270
No. 3 shaft	T.354	Vertical	2	295
No. 4 shaft (inactive)	T.1474	Vertical	2	150
No. 6 shaft	T.1110	Vertical	2	396
No. 4 winze (below 260-foot level)	T.1110	Vertical	2	310

Development work in 1960 consisted of 1,726 feet of drifting, 1,427 feet of crosscutting, and 1,423 feet of raising. Total development footage to 31 December 1960 was as follows: 13,734 feet of drifts, 14,510 feet of crosscuts, 3,373 feet of raises. Diamond-drilling in 1960 consisted of 170 holes, totalling 14,827 feet, from underground and 5 holes, totalling 1,315 feet, from surface.

The old smelter building was renovated to house the new milling unit.

New equipment included: 1 ball mill (7 x 5 ft., Canadian Allis-Chalmers); 1 classifier (4.5 x 22.2 ft., Akins high-weir type); 6 flotation cells (Denver, No. 18 special); 1 flotation cell (Denver No. 500); 1 jig (16 x 24, Denver duplex); 1 Wilfley table (6 ft.).

A total of 23,383 tons of ore was hoisted and milled; the mill averaged 64.1 tons daily.

The average number of employees was 73: 44 underground, and 29 on surface. J. E. Jerome was manager.

McIntyre Porcupine Mines Limited (Castle Division)

Castle-Trethewey Mines Limited was incorporated in January 1922, with an authorized capitalization of 3,000,000 shares of no par value, of which, 2,300,932 shares have been issued. In December 1959 the assets of Castle-Trethewey Mines Limited were purchased by McIntyre Porcupine Mines Limited, and it became the Castle Division of McIntyre. The directors and officers were: J. S. D. Tory, chairman of the board; J. D. Barrington, president and managing director; W. B. Dix, vice-president, treasurer, and director; Norman D'Arcy, J. C. Fraser, R. S. McLaughlin, and S. M. Wedd, directors; M. L. Urquhart, vice-president (operations); F. T. McKinney, secretary. The head office is at 25 King Street West, Toronto. The mine address is O'Brien.

The property, consisting of 45 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 operated from 1 May to 22 December 1960.

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	Vertical	—	160
No. 3 shaft	R.S.C.101	Vertical	2	850

Development work in 1960 included 4,189 feet of drifting, 322 feet of crosscutting, and 931 feet of raising. Total development footage to 31 December 1960 was as follows: 29,090 feet of drifts, 13,404 feet of crosscuts, 7,127 feet of raises. Diamond-drilling in 1960 consisted of 154 holes, totalling 13,236 feet, from underground.

New construction included a warehouse and office building (40 x 88 ft.); a guest house (28 x 43 ft.); and a manager's residence (24 x 36 ft.).

The following is taken from the annual report for the year ending 31 December 1960:

During the year, 23,291 tons of ore was milled, from which 1,252,222 ounces of silver, an all-time high, and 4,210 pounds of cobalt were recovered for a gross value of $1,139,059. Operating profit of $339,439 is also a record high. The broken-ore reserve at 31 December 1960 was estimated at 6,660 tons containing 276,930 ounces of silver, and coupled with the estimated ore in place amounts to about 500,000 ounces.

The vein systems from which most of the ore has been mined during the past two years are nearly exhausted. However, this situation has happened many times before in Castle's history; it is inherent in the hand-to-mouth nature of silver mining in Cobalt and Gowganda. There are three promising areas, which will be explored during 1961.

Capital expenditures were $199,928. Of this amount, $129,000 was for renovation of the mill, $38,800 for replacing the office-warehouse building, which was destroyed by fire in November 1959, and the remainder was for miscellaneous surface and underground equipment.

The average number of employees was 95: 61 underground, and 34 on surface. G. D. McLeod was manager.

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. The directors and officers were: W. H. Bouck, president and director; R. D. Lord, managing director; W. N. Millar 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 Limited in early 1960. This property comprises six claims in Coleman township, District of Timiskaming, on the west side of Cross Lake, about 1½ miles east of Cobalt.

Operations commenced on 16 June 1960 and were continuing at the year's end.

The King Edward winze, 865 feet deep, was dewatered to the 840-foot level. Five diamond-drill holes, totalling 2,900 feet, were completed from underground.

A hoist (Jenckes, 42 x 30 ins.) was installed.

The average number of employees was 5: 4 underground, and 1 on surface. E. C. Rudd was mine manager.

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 4,985,181 shares have been issued. The directors and officers were: Murray Cooper, president and director; R. K. Hart, vice-president and director; M. C. Hill, treasurer and director; J. D. Streit, Murray Watts, F. M. Fell, and E. F. Dodge, directors; J. M. Wainberg, secretary. 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 the Kerr Lake Mining Company and located south of the Lawson mine were acquired in 1959.

BRADY LAKE PROPERTY

The Brady Lake property, comprising six claims, which has also been called the Silver-Miller mine, is located in lots 2 and 3, concession III, Coleman township. It includes the old Lumsden, Rochester, Gillies, Cobalt Central, and Coleman Development (Pan Silver) mines.

The mine operated from 3 January until 28 February 1960; the mill operated from 1 April to 31 December 1960.

SHAFTS, BRADY LAKE PROPERTY

	Location	Inclination	Number of Compartments	Total Depth from Surface
				feet
No. 1 shaft (Lumsden)	Claim No. 367	Vertical	2	400
No. 4 winze (below 200-ft. level) (Lumsden)	——	Vertical	2	270
No. 2 shaft (Rochester)	Claim No. 119	Vertical	2	75
No. 3 shaft (Rochester)	Claim No. 119	Vertical	2	75
No. 4 shaft (Pan Silver)	SW.¼. N.½, lot 2, con. III, Coleman tp.	Vertical	2	632
No. 1 winze (below 285-ft. level) (Pan Silver)	——	Vertical	2	447
No. 3 winze (below 610-ft. level) (Pan Silver)	——	Vertical	2	746

Development work during the period of operation in 1960 consisted of 34 feet of raising. Total development footage to 31 December 1960 was as follows: 31,943 feet of drifts and subdrifts, 7,505 feet of crosscuts, 9,601 feet of raises. Diamond-drilling in 1960 consisted of 3 holes, totalling 1,014 feet, from underground.

A total of 113 tons of ore was hoisted; 1,532 tons was milled.

CONISIL PROPERTY

Silver-Miller Mines Limited acquired in 1960 an option to purchase claims held by Conisil Mines Limited. The property comprises 95.45 acres, immediately southwest of the Lawson mine.

Operations commenced on 1 February 1960 and were continuing at the year's end.

The vertical, two-compartment, Conisil shaft located on claim J.B.22 was sunk 150 feet in 1960, to a depth of 472 feet below surface. The 460-foot level was established, and service connections were made to the 300- and 400-foot levels of the Lawson workings. The Lawson shaft was used for all hoisting.

Development work in 1960 consisted of 523 feet of drifting, 163 feet of crosscutting, and 261 feet of raising. Total development footage to 31 December 1960 was as follows: 828 feet of drifts, 163 feet of crosscuts, 261 feet of raises. Some 33 diamond-drill holes, totalling 5,696 feet, were completed in 1960 from underground.

New construction included a headframe (60-foot, B.C. fir) together with a shafthouse (16 x 30 ft.); an ore bin (120-ton capacity); a change house (20 x 40 ft.); a hoistroom (16 x 20 ft.); a pumphouse (8 x 8 ft.).

Equipment installed consisted of a hoist (single-drum, 10 x 12 in., Canadian Ingersoll-Rand); a mine cage; and 1,500 feet of transmission line (220-volt).

A total of 1,451 tons of ore was hoisted and milled.

KERR LAKE PROPERTY

The Kerr Lake property comprises 145.7 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.

Development footage in 1960 consisted of 335 feet of drifting, and 308 feet of raising. Total development footage by Silver-Miller to 31 December 1960 was as follows: 467 feet of drifts, 308 feet of raises. Three diamond-drill holes, totalling 98 feet were completed, from underground.

A total of 5,453 tons of ore was hoisted and milled, together with some 31,942 tons from the surface dump.

LAWSON PROPERTY

Operations at the Lawson mine, which comprises one claim in Coleman township, continued throughout 1960.

SHAFTS, LAWSON MINE

	Location	Inclination	Number of Compartments	Depth
				feet
No. 8 shaft	SW.¼ of N.½, lot 3, con. IV, Coleman tp.	Vertical	2	410
Main shaft	SW.½ of N.½, lot 3, con. IV, Coleman tp.	Vertical	2	195

Development work in 1960 consisted of 66 feet of drifting, and 14 feet of raising. Total development footage to 31 December 1960 was as follows: 19,525 feet of drifts, 2,816 feet of crosscuts, 4,974 feet of raises. Diamond-drilling in 1960 consisted of some 23 holes, totalling 3,383 feet, from underground.

A transformer station (150-kva.) was installed.

No ore was hoisted from the Lawson mine.

The following is taken from the president's report for a six-month period ending 31 October 1960:

Production

In the six months ended 31 October 1960, a total of 27,103 tons of ore was treated in the La Rose mill for a recovery of 319,377 ounces of silver valued at $280,421. Operating profit for this period totalled $101,500, and a profit was also shown in November and December.

Development

It was only during the first two months of the above period that ore could be drawn from the recently acquired Conisil property. This was from a drive extended into that ground on the 400-foot level from the nearby Lawson mine. Subsequent diamond-drilling indicated this orebody to dip below the 400-foot level and to extend southward for a considerable distance. As a result, it was decided to deepen the more centrally located Conisil shaft to the south in order to establish a new level from which this ore can be mined in the most efficient and economical manner.

The Conisil shaft has since been completely rehabilitated, a new hoist and headframe installed, electric power run in, and the opening deepened 150 feet to prepare this new working horizon on the 460-foot level. As the elevation of the Conisil shaft collar is considerably lower than the Lawson ground to the north, this places the Conisil 460-foot level 100 feet below the Lawson 400-foot level. During this period, the bulk of the mill feed was drawn from extensive low-grade surface dumps on the Kerr Lake property. An estimated 134,201 ounces of silver were recovered from this dump materials, resulting in an operating profit from that source of $51,989.

Since completion of the Conisil shaft program, the downward extension of the main No. 1 vein has been picked up by crosscutting. This came in somewhat sooner than expected and, where encountered, showed excellent mineralization and ore grade. From indications to date, it appears quite likely that the ore structure will extend all the way to the south boundary of the Conisil property, a distance of about 900 feet.

The company has been acquiring considerably more ground in the Cobalt silver camp, much of it adjacent to present mine workings. These acquisitions are expected to add materially to profits and the productive life of the operation.

The average number of employees was 40: 18 underground, and 22 on surface. E. A. Pearson was manager.

Siscoe Metals of Ontario Limited

Siscoe Metals of Ontario Limited is a wholly-owned subsidiary of Siscoe Mines Limited. It was incorporated in September 1950 with an authorized capitalization of 4,000 shares of no par value, of which 2,150 shares have been issued. The directors and officers were: J. B. Lynch, president and director; Auguste Desilets, vice-president and director; J. G. Ahern, M. F. Nicholson, N. S. Beaton, W. A. Arbuckle, and J. P. Crete, directors; C. M. Masterman, secretary-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 16 claims in Nicol and Haultain townships, Gowganda area, District of Timiskaming.

Mining and milling continued throughout 1960. Work was carried on through No. 6 shaft, which was created in 1956 by raising No. 6 winze to surface.

SHAFTS, SISCOE METALS MINE[1]

	Claim No.	Inclination	Number of Compartments	Total Depth from Surface
				feet
No. 6 shaft	R.S.C.91	Vertical	2	844
No. 2 shaft (inactive)	R.S.C.91	75°	2	452
No. 1 winze (below 350-ft. level)	R.S.C.91	75°	2	457
No. 2 winze (below 350-ft. level)	R.S.C.91	82°	2	460
No. 3 winze (below 350-ft. level)	R.S.C.91	76°	2	405
No. 4 winze (below 350-ft. level)	R.S.C.91	82°	2	525
No. 5 winze (below 525-ft. level)	R.S.C.91	Vertical	2	650
No. 7 winze (below 730-ft. level)	R.S.C.91	75°	2	908
No. 8 winze (below 730-ft. level)	R.S.C.92	68°	2	790
No. 9 winze (below 730-ft. level)	R.S.C.91	Vertical	3	908
No. 11 winze (below 850-ft. level)	R.S.C.92	Vertical	2	1,359
No. 20 shaft	R.S.C.94	76°	2	163

[1]This table includes only the shafts and winzes that have been used in the present company's operations.

Development work in 1960 consisted of 4,028 feet of drifting, 252 feet of crosscutting, and 874 feet of raising. Total development footage by present operators to 31 December 1960 was as follows: 62,456 feet of drifts, 15,918 feet of crosscuts, 5,257 feet of raises. Diamond-drilling in 1960 consisted of 197 holes, totalling 18,515 feet, from underground.

New equipment added included the following:

SURFACE
3 transformers (300-kva.).
ASSAY OFFICE
1 electric furnace (Model 610, Hoskins-Walker Metals)
1 balance (Chain-o-matic, Christian Bros.).
NEW REFINERY
1 jaw crusher (5 x 6 ft., Allis-Chalmers).
1 rolls crusher (10 x 6 ft., Sturtevant).
2 amalgam barrels (36 x 48 ft., Denver Equipment).
1 tilting furnace; 2 Rockwell furnaces; 1 bullion scales; 2 oil furnaces; 1 air compressor (250-cfm., Canadian Ingersoll-Rand).
UNDERGROUND
2 stopers (Canadian Ingersoll-Rand).
1 locomotive (Mancha).
1 loader (Eimco) and 10 mine cars.

A total of 64,534 tons of ore was hoisted and milled. The mill treated an average of 237 tons per operating day.

The average number of employees was 98: 67 underground, and 31 on surface. G. Shartner was mine manager.

TELLURIUM—*see* NICKEL AND COPPER

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; H. D. Doan, E. B. Gillanders, Roger Jeanty, D. J. McParland, and J. L. Smart, directors; George Baker, secretary; B. A. Howard, treasurer; G. R. Devey, assistant secretary; J. W. Hamilton, assistant treasurer. The head office is at 335 Bay Street, Toronto. The plant address is Box 190, Elliot Lake.

The new plant was completed and operations commenced on 26 January 1959. The plant is designed to produce a thorium concentrate from treatment of the Algom Quirke mill tailings, using a solvent extraction process.

New construction in 1960 included a pole-type warehouse (54 x 90 feet, with metal siding and 6-inch reinforced concrete floors). A research laboratory consisting of two laboratories, two offices, benches, and equipment was installed in the thorium plant.

The average number of employees was 25. J. L. Hopkins was plant superintendent, and M. E. Grimes was research manager.

URANIUM

Production decreased 22.35 percent in quantity and 21.06 percent in value from the 1959 production. The industry employed 1,277 salaried personnel and paid them $7,837,511, and 6,079 wage-earners and paid them $36,166,044. Fuel and electricity used cost $5,670,042, and process supplies used cost $23,127,106.

Bicroft Uranium Mines Limited

Bicroft Uranium Mines Limited was formed in April 1955 as an amalgamation of Centre Lake Uranium Mines Limited and Croft Uranium Mines Limited. The authorized capitalization is 4,000,000 shares of $1 par value, of which 3,057,475 shares have been issued. The directors and officers were: R. A. Bryce, president and director; J. D. Bryce, executive vice-president and director; S. A. Perry, vice-president and director; J. H. Crang, E. D. Scott, J. D. Boeckh, and J. C. L. Allen, directors; G. D. Pattison, secretary-treasurer; H. W. Salthouse, assistant secretary-treasurer. The head office is at 25 Adelaide Street West, Toronto. The executive office is at 85 Richmond Street West, Toronto. The mine address is R.R. 3, Bancroft.

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 1960.

SHAFTS, CENTRE LAKE MINE

	Location	Inclination	Number of Compartments	Total Depth from Surface
				feet
No. 1 shaft	Claim E.O. 5936, N.½, lot 27, con. XI, Cardiff tp.	Vertical	3	234
No. 2 shaft	S.½, lot 28, con. XI, Cardiff tp.	Vertical	5	1,433

The No. 2 shaft was sunk 119 feet in 1960 to a depth of 1,433 feet below surface; the 11th level was established at a depth of 1,350 feet.

Development work in 1960 consisted of 12,433 feet of drifting, 8,879 feet of crosscutting, and 17,602 feet of raising. Total development footage to 31 December 1960 was as follows: 56,644 feet of drifts, 46,130 feet of crosscuts, 50,657 feet of raises. Diamond-drilling in 1960 consisted of 535 holes from underground, totalling 80,662 feet.

New equipment installed included an electronic sorting-unit (capacity 30 tph., K. and H. Equipment).

The following is taken from the mine manager's report for the year ending 31 December 1960:

Production

The data tabulated below summarizes operating results in 1960, the fourth year of production, and also provides comparative data on the preceding three years.

	1960	1959	1958	1957
Hoisted.....tons	454,232	471,321	472,709	414,024
Average per day.....tons	1,243	1,291	1,295	1,134
Discarded in sorting plants.....tons	52,355	46,948	(1)8,029	——
Average discarded per day.....tons	143	129	(1)75	——
Milled.....tons	404,682	424,373	464,680	414,024
Average milled per day.....tons	1,110	1,162	1,273	1,134
Recovery per ton milled.....	$20.06	$19.53	$19.05	$17.28
Recovery.....percent	94.3	92.9	92.1	91.4
Grade of millfeed.....	$21.27	$21.02	$20.68	$18.92

(1)Sorting with one unit for 3½ months only.

OPERATING COSTS PER TON MILLED

	1960	1959	1958	1957
Development.....	$ 2.53	$ 1.96	$ 2.04	$ 2.79
Mining.....	4.58	4.33	4.03	3.78
Milling.....	3.26	3.64	3.67	3.79
General mine expense.....	(1) 1.07	0.80	0.94	1.06
Total.....	$11.44	$10.73	$10.68	$11.42

(1)Including outside exploration costs.

Mining

By the year's end, extraction of all ore, developed to date, above the fourth (450-foot) level was practically completed, and the fifth and sixth levels were supplying only 25 percent of the ore hoisted. Development and mining operations were accordingly concentrated on the seventh, eighth, and ninth levels, each of which was supplying about 25 percent of the ore hoisted. Development work was started on the tenth (1,200-foot) level.

Stoping

Operations during the year and to date are briefly summarized in the tabulation below:

	1960	1959	1958	To Date
Broken.....tons	362,191	389,496	429,917	1,661,232
Drawn.....tons	370,946	402,988	417,648	1,604,605
Proportion of ore hoisted.....percent	81.9	85.1	88.0	——
Broken-ore reserves.....tons	56,627	75,382	89,874	——
Number of stopes worked.....	213	168	174	442
Number of stopes completed.....	110	103	96	345
Number of new stopes started.....	142	87	84	——

The figures above reflect the change in ore conditions described under development.

Average stoping length during the year was 53 feet and average width 5.7 feet. The shrinkage method continued in general use. During the year, 75,064 tons of development and sorting-plant waste were placed as backfill in worked-out stopes.

Ore Reserves

The nature of the orebodies is such that it is difficult to make accurate estimates of the ore reserves in the conventional subdivisions of possible, probable, and positive ore tonnages. Accordingly, the practice of estimating reserves on the basis of the potential of the ore zone as developed to date in terms of tons per vertical foot, is based on actual quantities extracted on the upper levels. On this basis, possible and probable ore reserves, including broken reserves, above the tenth (1,200-foot) level as of 31 December 1960, were 559,000 tons grading two pounds of U_3O_8 per ton before dilution. This figure includes 56,627 tons in broken reserves underground. These reserves are sufficient to complete firm contracts held as of 1 January 1961, but are not sufficient to support any substantial additional production. Continuation of the ore zone to depth is anticipated, and development of additional reserves is therefore a matter of deepening the shaft and developing additional levels.

Milling

Crusher plant feed totalled 454,232 tons, respresenting an average of 1,243 tons per day. A total of 96,902 tons (21.3 percent) of this feed was processed in the sorting plant, and 52,355 tons (54 percent) was discarded as waste. The discarded tonnage therefore represented 11.5 percent of the ore hoisted. The sorting process up-graded the ore by an average of 11.4 percent.

The mill operated at an average rate of 1,110 tons of sorted ore per day.

Over-all average recovery at 94.3 percent was at a new high. Recovery has shown steady improvement since the start of operations.

Various improvements in operating techniques were again made, which resulted in a further reduction in milling costs, in spite of wage increases.

The average number of employees was 556: 361 underground, and 195 on surface. J. M. Thompson was manager.

Canadian Dyno Mines Limited

McLellan Gold Mines Limited was incorporated in 1951. In June 1953 the name was changed to Dyno Mines Limited. In December 1956 the name was further changed to Canadian Dyno Mines Limited. The authorized capitalization is 3,000,000 shares of $1 par value, of which 2,846,000 shares have been issued. The directors and officers were: S. A. Perry, president and director; Louis Pancer, vice-president and managing director; C. A. Campbell, Hon. C. P. McTague, L. P. Chalmers, G. C. Knowles, and H. H. Wright, directors; G. D. Pattison, secretary-treasurer; R. D. Bell, assistant secretary-treasurer. The head office is at 25 Adelaide Street West, Toronto. The mine address is R.R. 3, Bancroft.

The company's principal holding consists of 26 claims, in concessions VII, VIII, IX, XI, XII, and XIII, Cardiff township, Haliburton county.

Operations continued from 1 January to 15 April 1960.

The vertical, three-compartment shaft is 1,719 feet below the collar.

The following table gives the development footages in 1960, and the cumulative totals to the time of closure.

UNDERGROUND DEVELOPMENT, CANADIAN DYNO MINE

Level	Drifts		Crosscuts		Raises	
	1960	Total	1960	Total	1960	Total
	feet	feet	feet	feet	feet	feet
180-foot	—	2,017	—	439	—	1,548
330-foot	191	2,278	103	4,502	—	3,008
480-foot	—	6,068	—	8,696	—	3,794
630-foot	—	3,918	256	5,847	55	3,826
780-foot	22	5,077	24	8,263	6	4,213
Loading pocket	—	—	—	—	—	244
930-foot	17	81	33	1,479	—	214
1,530-foot	—	—	—	150	—	—
Total	230	19,439	416	29,376	61	16,847

Diamond-drilling in 1960 consisted of 34 holes totalling 4,012 feet, from underground.

The following is taken from the mine manager's report for the year ending 31 July 1960:

The property operated only 8½ months during the year. Production was stopped on 15 April 1960 as a result of the successful conclusion of the Dyno-Gunnar agreement. During this period, 209,291 tons of ore were treated at a daily average rate of 865 tons, a slight decrease from the previous year. The grade of ore treated, however, was slightly higher at 1.303 pounds U_3O_8 per ton. All ore treated came from the underground operation.

During the year, 15 lots of U_3O_8 concentrate, weighing about 20,000 pounds each, were shipped, four of which went to the United Kingdom Atomic Energy Authority, with the balance going to the Atomic Energy Commission in the United States.

Milling

The mill operated 92.6 percent of available time and treated 209,291 tons at an average daily rate of 865 tons per day.

Over-all recovery was improved during the year by 0.73 percent. Operating costs increased $0.21 per ton, owing mainly to higher acid consumption and substantially increased costs during the mill clean-up phase at the close of operations. The average grade of precipitate increased by 2.93 percent.

The mill clean-up, following the cessation of operations, produced 7,381 pounds of U_3O_8, about 1,000 pounds higher than that estimated to be tied up in the mill circuit.

The following table summarizes mill operating data, with comparative figures for 1958–59 and to date:

	1959–60	1958–59	To Date
Milled ..... tons	209,291	381,750	660,850
Grade ..... lb.	1.303	1.233	1.253
Daily average ..... tons	865	1,046	932
Extraction ..... percent	97.48	96.49	96.70
Soluble loss ..... percent	0.80	0.54	0.68
Recovery ..... percent	96.68	95.95	96.02
Cost per ton ..... $	2.61	2.40	2.50
Precipitate grade U_3O_8 ..... percent	80.49	77.56	78.22

Mining

During the year mining was active in all ore zones between the second and fifth levels. Twenty-nine new stoping sections were opened up, and 38 were completed. During the mining activities at the mine, 124 stopes were operated. This figure does not include those that were not mined past the stope preparation stage for grade reasons.

All mill feed came from the underground operation, with 92.1 percent of the pull coming from stopes whereas the balance was made up from development work. The grade of stope ore pulled was slightly higher at 1.327 pounds U_3O_8 per ton.

All stope break was stopped at the end of January pursuant to the joint venture arrangement entered into with Gunnar Mines Limited.

Ore Reserves

As has been the custom in previous years, no estimate has been made of ore reserves in place. All broken ore was pulled and milled during the year. It has been estimated that sufficient ore could have been developed on the five new levels to complete the original Eldorado contract.

Operating Costs

Operating costs were down from the previous year owing mainly to the fact that less current development work was carried out while shaft-sinking was in progress. The following table summarizes operating costs during the past year, with comparable figures for previous years and to date. No allowance has been made for administration costs, debenture interest, taxes, and write-offs.

Distribution	1959–60	1958–59	1957–58	To Date
Mining	$ 3.87	$ 3.57	$ 4.34	$ 3.73
Milling	2.61	2.40	2.75	2.50
Development	1.42	2.21	4.27	2.17
Marketing	0.01	0.01	0.01	0.01
General	0.60	0.48	1.05	0.58
Total	$ 8.51	$ 8.67	$12.42	$ 8.99

Shut Down

Following the completion of the Dyno-Gunnar agreement, steps were taken immediately to close down the operation. All available broken ore was hoisted and treated. The mill circuit was cleaned out. The underground was completely salvaged. Electrical cable, electrical equipment, plumbing fixtures, and heating equipment were stripped from all buildings. Surface pipelines were salvaged. All major equipment was cleaned, and corrosive-resistant measures were taken to insure protection during prolonged storage. Equipment lists were prepared and distributed. The sale of equipment, supplies, and buildings has been proceeding satisfactorily.

The average number of employees was 64: 26 underground, and 38 on surface. P. S. Cross was mine manager.

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 the 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 4,687,650 shares have been issued. The directors and officers were: S. B. Roman, president and director; A. W. Stollery, vice-president and director; J. C. Puhky, secretary-treasurer and director; F. H. Jowsey, B. E. Willoughby, Joseph Sedgewick, J. S. Williams, G. C. Knowles, and Murray Axmith, directors; H. A. Willis, vice-president; E. B. McConkey, assistant secretary-treasurer. The head office is at 360 Bay Street, Toronto. The mine address is P.O. Box B-2600, Elliot Lake.

DENISON DIVISION

The company's main holding consists of 88 claims in Townships 144 and 150 Blind River area, district of Algoma.

SHAFTS, CONSOLIDATED DENISON MINE

Shaft	Claim No.	Inclination	Number of Compartments	Total Depth from Surface
				feet
No. 1	S.86071	Vertical	5	1,856
No. 2	S.86118	Vertical	8	2,776

Development work in 1960 consisted of 21,604 feet of drifting. Total development footage on a single plane to 31 December 1960 was as follows: 109,680 feet of drifting; 1,611 feet of raising. Some 1,681 diamond-drill holes, totalling 37,235 feet, were completed in 1960 from underground.

New construction included a grinding-plant sump (floor-area 1,225 sq. ft., with 10-ft. walls).

New equipment installed consisted of an ammonia tank in the concentrator building (40-ton capacity, 9-ft. diameter, 40 ft. high, Toronto Iron Works Limited), and two elution towers in the concentrator boiler house (51 U.S. gallon capacity, 8-ft. diameter, 12 ft. high, Whitley Reid Engineers Ltd., Nottingham England).

The average number of employees was 1,367: 822 underground, and 545 on surface. John Kostiuk was general manager; M. J. de Bastiani was mine manager.

CAN-MET DIVISION

Can-Met Explorations Limited was incorporated in April 1944, with an authorized capitalization of 5,000,000 shares of $1 par value. In December 1957, the number of shares was increased to 5,500,000, of which 4,687,650 had been issued. In March 1960, through amalgamation of Can-Met Explorations with Consolidated Denison Mines Limited, Can-Met became the Can-Met Division of Denison Mines Limited. Operations at the Can-Met Division were terminated in April, and its plant was placed on a care and maintenance basis.

The property consists of 35 claims, adjoining the eastern part of the south boundary of the Denison property, in Townships 144 and 150, Blind River area, District of Algoma.

SHAFTS, CAN-MET MINE

Shaft	Location	Inclination	Number of Compartments	Total Depth from Surface
				feet
No. 1 (service)	S.67833	Vertical	2	2,127
No. 2 (production)	S.67839	Vertical	3	2,395

The following table gives the development footage in 1960, and the cumulative totals to the time of closure.

UNDERGROUND DEVELOPMENT, CAN-MET MINE

Level	Drifts		Crosscuts		Raises	
	1960	Total	1960	Total	1960	Total
	feet	feet	feet	feet	feet	feet
150-foot	—	—	—	—	—	180
2,100-foot	644	32,389	—	2,591	—	242
2,260-foot	—	—	—	—	—	180
Total	644	32,389	—	2,591	—	602

The mine operated from 1 January to 1 April; the mill from 1 January to 7 April 1960. During the period of operation, 250,504 tons of ore was hoisted; the mill treated 256,450 tons averaging 2,617 tons daily.

The average number of employees was 437: 239 underground, and 198 on surface. R. D. Lindberg was mine manager.

The following is taken from the company's annual report for the year ending 31 December 1960:

Operations, continuing at present concentrator capacity, were highlighted by the marked success of the cost-reduction program and by improvement in the grade of mill heads from 2.56 pounds U_3O_8 per ton in 1959 to 2.70 pounds U_3O_8 per ton in 1960.

Industrial engineering studies, coupled with a system of plant-wide budgetary control and associated with thorough planning and supervision, reduced over-all operating costs about $1.00 per ton from the previous year. This reduction was accomplished in the face of substantial increases in certain unit costs beyond the control of the company. The most significant of these were 8 cents for acid, 2 cents for explosives and steel products, and 2.5 cents for power, the latter effective as of 1 November 1960. In addition, and as a result of negotiations with unions representing employees in this Division, increases in labour costs amounted to 10 cents per ton.

The mechanization of accounting procedures has permitted the consolidation of clerical duties and has made possible an increase in the scope and promptness of reporting cost information. This feature has contributed to the success of the continuing cost-reduction program.

Lower mining costs were achieved through centralization of working places, direct scraping of run-of-mine ore to conveyors, strict control of operating supplies, and from studies in rock mechanics, the last initiated three years ago. Associated with these factors was the expected reduction in milling costs resulting from the successful conversion to pebble grinding, and from economies in plant maintenance.

Mining

Of the total of 1,962,348 tons hoisted, 781,996 tons were from No. 1 shaft and 1,180,352 tons from No. 2 shaft.

A total of 62,872 feet of linear work, 99 percent in ore, was completed during the year. This lineal program prepared the tonnage mined and established positive reserves to 2,500,000 tons of a known grade.

The three main conveyor arteries were extended a combined distance of 1,550 feet. Three conveyors, 701, 495, and 804 feet in length, were relocated for direct scraping from stopes.

Milling

A total of 2,013,846 dry tons of ore was treated for a daily average of 5,787 tons, as compared with 5,672 tons in 1959. Over-all recovery for the year was 93.04 percent, slightly lower than the 93.55 percent figure achieved in 1959. This drop resulted from a higher insoluble loss caused by the milling of a more highly contaminated ore and, to a lesser degree, from the lowering of the soluble iron content in the leaching solutions as a result of conversion from ball to pebble grinding.

The planned cost-reduction program in the extraction plant was successful in reducing over-all milling costs. Total savings were distributed mainly between maintenance labour and supplies and operating supplies, through the adoption of improved techniques. Further reduction in maintenance and reagent costs are anticipated for 1961.

Advantage was taken of the holiday shutdown 1–17 July 1960, to do such necessary examination and maintenance as was impractical during normal operation.

The changeovers from ball to pebble grinding and from magnesia precipitation to that of ammonia were successfully accomplished during the year.

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; E. T. Donaldson, vice-president and director; A. B. Whitelaw, secretary and director; William McKee, W. C. Campbell, G. L. Jennison, and J. K. McCausland, directors; W. M. O'Shaughnessy, treasurer. The head office is at 100 Adelaide Street West, Toronto. The mine address is Bancroft.

The company holds about 2,600 acres, in concessions A, B, IX, X, and XI, Faraday township, Hastings county.

SHAFTS, FARADAY MINE

Shaft	Location	Inclination	Number of Compartments	Sinking in 1959	Total Depth below Adit Level
				feet	feet
No. 1	Lot 16, con. XI, Faraday tp.	Vertical	3 to 750 feet 4 below 750 feet	371	1,455
No. 2	Lot 17, con. XI, Faraday tp.	Vertical	3	—	196

Development work in 1960 consisted of 5,838 feet of drifting, 3,787 feet of crosscutting, and 6,761 feet of raising. Total development footage to 31 December 1960, was as follows: 45,024 feet of drifts; 30,207 feet of crosscuts; 34,012 feet of raises. Diamond-drilling in 1960 consisted of 426 holes, totalling 74,905 feet, from underground.

A mill-laboratory extension (20.3 x 6 ft.) was constructed.

New equipment added was as follows:

1 X-ray spectrograph in mill laboratory (No. 42131/3B, Phillips).
1 after cooler (120 sq. ft.) in compressor house No. 2.
1 mine-air heater in ventilation building No. 2 (2,500,000 Btu, Calorific Ltd.)
1 ventilation fan, in ventilation building No. 2 (Super B, 50,000 cfm., Can. Blower).
1 underground radiometric assay system (Electronic Associates).

The following is taken from the mine manager's report for the year ending 31 December 1960:

Mining

All production mining was confined to the area above the 600-foot level. Mining conditions and methods continued unchanged, with the bulk of the ore being derived from shrinkage stoping. This resulted in an increase in broken-ore reserves of 106,140 tons to make a total of 256,600 tons of an average grade of 0.106 percent U_3O_8. It is anticipated that tonnage of broken reserves will reach a peak early in 1961.

The grade of ore broken improved, due in part to the effect of better material developed in the past year, but largely because of greater selectivity possible with the reduced mining rate.

Milling

	1960	1959	1958	1957
Milled ..... tons	468,939	537,594	491,826	280,668
Milled, daily average ..... tons	1,282	1,473	1,347	1,160
Heads U_3O_8 ..... percent	0.1000	0.0870	0.0920	0.0860
Tails U_3O_8 ..... percent	0.0049	0.0040	0.0056	0.0068
Recovery ..... percent	95.11	95.34	94.00	91.90
Precipitate grade U_3O_8 ..... percent	76.14	75.66	70.50	67.10

Costs

Operating costs again show a substantial improvement, due in large part to the decreased rate of development. The slightly higher direct mining cost reflects the lower tonnage of ore being handled. Comparative figures are shown in the table below:

	1960	1959	1958	1957
Development	$1.40	$2.12	$2.54	$2.34
Mining	4.35	3.96	4.41	3.77
Milling	2.96	3.00	3.05	3.69
Ore conveyance	Nil	Nil	Nil	0.25
Total	$8.71	$9.08	$10.00	$10.05

Capital expenditures before annual write-offs amounted to $60,715. Deferred development charges for underground ventilation and ore- and waste-passes to service the shaft extension totalled $78,260.

Ore Reserves

The amount of development now completed in the mine, combined with the body of technical knowledge and operating experience gained over the past several years, permit for the first time calculations of ore reserves on a sound engineering basis. As of 31 December 1960, these were:

	Amount	Grade
	tons	percent U_3O_8
Proven ore:		
Broken	256,600	0.106
In place	451,300	0.118
Total proven ore	707,900	0.114
Probable ore	417,000	0.097
Total reserves	1,124,900	0.107

About 90 percent of the proven-ore reserves lie above the 600-foot level, and there are sufficient total reserves above this level to complete the present Eldorado contract.

Of the probable ore, 62 percent is indicated by diamond-drilling on the 750- and 900-foot levels.

No reserves whatever have been calculated for the two working levels below the 900-foot on which, to date, no development has been carried out.

The average number of employees was 429: 258 underground, and 171 on surface. D. R. Wilson was mine manager.

Preston Mines Limited (Stanleigh Division)

In August 1960, Stanleigh Uranium Mining Corporation Limited and Preston East Dome Mines Limited were amalgamated under the name of Preston Mines Limited. Further details pertaining to both companies will be found in the gold section of this report, under Preston Mines Limited.

The Stanleigh property comprises 108 claims in Townships 149 and 155, Blind River area, District of Algoma.

Mining and milling continued from 1 January to 30 November 1960, at which time operations were discontinued.

The following table gives the development footage during the operating period in 1960, and the accumulated total at the time of closure.

UNDERGROUND DEVELOPMENT, STANLEIGH MINE

Level No.	Drifts		Crosscuts		Raises	
	1960	Total	1960	Total	1960	Total
	feet	feet	feet	feet	feet	feet
2	503	503	—	8	517	572
3	—	103	—	—	—	15
4	1,814	2,837	—	309	1,640	1,841
5	1,773	3,667	—	992	4,035	6,502
6	260	2,925	—	674	1,163	5,207
7	231	3,107	—	—	1,127	4,990
8	1,709	5,011	—	324	2,750	7,863
9	1,281	8,369	—	7,259	1,803	11,580
10	370	2,130	—	429	1,513	4,585
11	338	810	—	—	1,429	1,817
12	1,066	2,121	—	215	2,399	3,462
13	1,246	3,078	—	125	1,654	3,227
14	1,471	2,981	997	1,450	142	366
Total	12,062	37,642	997	11,785	20,172	52,027

Diamond-drilling in 1960 consisted of 676 holes, totalling 16,206 feet, from underground.

During the period of operation a total of 958,546 tons of ore was hoisted, and 963,396 tons was milled; the mill averaged 2,876 tons daily.

SHAFTS, STANLEIGH MINE

Shaft	Claim No.	Inclination	Number of Compartments	Total Depth
				feet
No. 1	S.75393	Vertical	4 to 3,792 feet 3 from 3,792 to 3,846 feet	3,846
No. 2	S.75393	Vertical	3	3,650

The following is taken from the resident engineer's report for the period 1 July 1959 to 31 December 1960:

In the twelve-month period ended 30 June 1960, 983,454 tons, grading 2.11 pounds U_3O_8 per ton, was milled. Of this, the mill recovered 1.99 pounds per ton for a production of 1,958,130 pounds of oxide. Mine operating costs averaged $10.34 per ton milled over the period, and development advance totalled 58,396 feet and converted a large part of the mine over from the trackless method.

In the two months ended 31 August 1960, 179,557 tons grading 2.15 pounds U_3O_8 per ton was milled for a recovery of 2.05 pounds per ton and a production of 351,668 pounds of oxide. Mine operating costs averaged $7.82 per ton milled, and development advance, totalling 5,326 feet, was held to a minimum pending clarification of the future operational plans.

From 1 September to 30 November, the mill treated 275,808 tons of ore grading 2.303 pounds per ton. The recovery was 2.145 pounds per ton, and the production amounted to 598,741 pounds. Shipments totalled 675,818 pounds U_3O_8, of which 398,905 pounds were delivered under the Stanleigh contract, and 162,731 pounds remained on hand at the end of November. Mine operating costs averaged $6.67 or $3.07 per pound over this period. As the operation was working towards a fixed shut-down date, only 1,645 feet of development was done, and less than 1,000 tons of broken ore was left in the mine at 1 December.

Prior to 1 December, plans had been completed by all departments for the orderly shut-down and salvage operation. An estimate of stripping the mine of all useful equipment and materials and the cleaning and storage of plant and equipment was placed at $480,000. At the year's-end, costs had totalled 64 percent of this figure, and 73 percent of the total shut-down task was estimated to be complete. The shafts have been capped, and sand-blasting and painting of valuable items of mine equipment are in progress. The camp area was cleared of all readily salvageable material, and buildings boarded up. The winter season has presented some difficulties in various phases of the work, but good work performance and morale have been the experience throughout the final months of production and the shut-down operations. In the reduction of crews, seniority has been observed in almost all cases.

The average number of employees was 619: 353 underground, and 266 on surface. R. Ellerman was resident engineer.

Rio Algom Mines Limited

Algom Uranium Mines Limited was incorporated in July 1953, with an authorized capitalization of 6,000,000 shares of $1 par value, of which 4,344,797 shares had been issued. Milliken Lake Uranium Mines Limited was incorporated in October 1952 with an authorized capitalization of 7,000,000 shares of $1 par value, of which 6,684,800 shares had been issued. Northspan Uranium Mines Limited was incorporated in June 1956 with an authorized capitalization of 10,000,000 shares of $1 par value, of which 7,219,966 shares had been issued. Pronto Uranium Mines Limited was incorporated in June 1953 with an authorized capitalization of 5,000,000 shares of $1 par value, of which 2,710,713 shares had been issued. 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 on the following basis: 165 shares Rio Algom for each

100 shares Algom; 14 shares Rio Algom for each 100 shares of Milliken; 13 shares of Rio Algom for each 100 shares of Northspan; 35 shares of Rio Algom for each 100 shares of Pronto. The authorized capitalization of Rio Algom Mines Limited is 12,000,000 shares of no par value, of which 10,002,032 shares have been issued. The directors and officers were: Hon. R. H. Winters, president and director; W. H. Bouck, vice-president and director; C. C. Calvin, J. G. Edison, E. B. Gillanders, Hon. S. A. Hayden, J. H. Hirshhorn, Roger Jeanty, J. H. Smith, R. W. Wright, and F. R. Joubin, directors; George Baker, secretary; W. B. Malone, treasurer; D. A. Macfarlane, assistant treasurer; G. R. Devey, assistant secretary. The head office is at 335 Bay Street, Toronto 1. The address of the mines in the Elliot Lake area is Elliot Lake.

ALGOM DIVISION

The property comprises 283 claims in the Blind River area, District of Algoma. Two mines, the Algom Nordic and the Algom Quirke, are being operated.

ALGOM NORDIC MINE

Mining and milling operations continued throughout 1960 at the Algom Nordic mine in Townships 143, 149, and 155.

The vertical, six-compartment, Nordic No. 1 shaft, located on claim S.66619 in Township 149, is 1,331 feet deep.

Development work in 1960 consisted of 5,653 feet of drifting, 1,728 feet of crosscutting, and 16,684 feet of raising. Total development footage to 31 December 1960, was as follows: 57,550 feet of drifts; 9,336 feet of crosscuts; 92,735 feet of raises. During the year, one diamond-drill hole totalling 960 feet, was completed from underground.

New construction included a water-softener building (21.9 x 14.3 x 13 feet), and a fuse-and-cap magazine (10 x 18 x 9 feet), both concrete block walls and Q deck steel with bonded roof.

New equipment added consisted of a Cochrane water softener, with accessory equipment, and a ventilation fan (108-in. vane axial, 300,000 cfm., with 400-hp. motor, Sheldon type 912-V25).

A total of 1,044,600 tons of ore was hoisted, and 1,042,100 tons was milled; the mill averaged 2,960 tons daily.

ALGOM QUIRKE MINE

The Algom Quirke mine, comprising 140 claims, adjoins the north boundary of the Denison Mines property.

Mining and milling operations continued throughout 1960.

The vertical, five-compartment, Quirke No. 1 shaft, on claim S.66899, is 1,208 feet deep. In 1960, sinking of the vertical, six-compartment, Quirke No. 2 shaft, on claim S.67240, had progressed to a depth of 55 feet below the collar.

Development work in 1960 consisted of 10,002 feet of drifting, 4,714 feet of crosscutting, and 16,586 feet of raising. Total development footage to 31 December 1960 was as follows: 74,747 feet of drifts; 19,924 feet of crosscuts; 99,789 feet of raises. During the year some 88 diamond-drill holes totalling 6,444 feet were completed from underground, and two holes totalling 1,302 feet were completed from surface.

New construction in 1960 consisted of No. 2 shaft headframe and shaft house (130 feet high, structural steel), with 1,000-ton ore bin, 250-ton waste bin,

two 12-ft. and two 10-ft. diameter sheaves; a skip hoistroom, compressor room and electrical switch-room building (94 x 94 ft., with steel frame and concrete-block panel walls).

New equipment installed was as follows:

No. 2 SHAFT SUBSTATION:
2 transformers, (one 3,750 kva., one 5,000 kva., 44/2.3 kv., 3-phase, 60-cycle, English Electric).
1 oil circuit-breaker (44-kv., English Electric).
No. 2 SHAFT HOISTROOM:
1 skip hoist (144 x 78 ins., double-drum, with two 1,500-hp., 600-rpm. motors, and electrics for semi-automatic operation, Canadian Ingersoll-Rand).
No. 2 SHAFT COMPRESSOR ROOM:
2 air compressors (29 and 18 x 14.5 ins., with 500-hp., 300-rpm., 2,500-v motors, with after-coolers and air receivers, Canadian Ingersoll-Rand).

A total of 1,028,523 tons of ore was hoisted, and 1,026,458 tons was milled; the mill averaged 2,812 tons daily.

The average number of employees at the Nordic mine was 679: 323 underground, and 356 on surface.

The average number of employees at the Quirke mine was 682: 376 underground, and 306 on surface. W. P. Arnold was general manager; G. M. Godfrey was mine manager; E. W. Cheeseman was general mine superintendent, in charge of both operations.

MILLIKEN DIVISION

The property consists of 24 claims, immediately east of Elliot Lake in Township 149, District of Algoma.

Mining and milling operations continued throughout 1960.

SHAFTS, MILLIKEN LAKE MINE

Shaft	Location	Inclination	Number of Compartments	Total Depth from Surface
				feet
No. 1 (service)	S.80247	Vertical	2	3,071
No. 2 (production)	S.80247	Vertical	3	3,400

The 276 south raise was driven a further 268 feet for a total length of 1,312 feet; the 2,680-foot level was established.

Development work in 1960 consisted of 3,742 feet of drifting, 2,480 feet of crosscutting, and 20,626 feet of raising. Total development footage to 31 December 1960, was as follows: 31,442 feet of drifts; 10,364 feet of crosscuts; 85,501 feet of raises. Diamond-drilling in 1960 consisted of some 1,921 holes, totalling 25,149 feet, from underground.

A total of 1,065,220 tons of ore was hoisted; 1,066,791 tons was milled, at an average of 3,083 tons daily.

The average number of employees was 609: 314 underground, and 295 on surface. R. D. Lord was general manager; Robert Olson was mine manager; G. S. Stenning was mine superintendent.

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.

LACNOR MINE

The Lacnor property comprising 29 claims is located in Township 149, District of Algoma.

Mining operations continued from 1 January to 3 June; milling continued from 1 January to 8 June 1960, when operations were discontinued.

SHAFTS, LACNOR MINE

Shaft	Claim No.	Inclination	Number of Compartments	Total Depth from Surface
				feet
No. 1	S.80071	Vertical	4	3,663
No. 2	S.80064	Vertical	4	2,970

No. 1 shaft was sunk a further 153 feet in 1960, to a total depth of 3,663 feet below the collar.

The following table gives the development footage during the operating period in 1960, and the accumulated total to the time of closing:

UNDERGROUND DEVELOPMENT, LACNOR MINE

Level	Drifts		Crosscuts		Raises	
	1960	Total	1960	Total	1960	Total
	feet	feet	feet	feet	feet	feet
Ventilation adit (84 feet)	—	—	—	286	—	—
84-foot	—	—	—	38	—	—
500-foot	—	—	—	20	—	—
1,000-foot	—	—	—	129	—	—
1,500-foot	—	—	—	20	—	—
2,000-foot	—	—	—	100	—	—
2,300-foot	—	—	—	132	—	—
2,370-foot	—	—	—	371	—	74
No. 2	724	3,284	—	—	2,361	6,025
No. 3	244	4,834	—	140	1,326	14,568
No. 4	76	5,755	—	272	923	14,488
No. 5	—	8,895	—	1,814	—	13,218
No. 6	64	11,641	—	175	1,206	16,748
No. 7	—	572	—	44	—	—
No. 8	157	14,506	—	3,618	1,296	29,347
Upper loading-pocket	—	—	—	—	—	451
Upper crusher level (obsolete)	—	—	—	42	—	—
No. 9	580	580	376	1,186	7	115
No. 10	504	504	—	1,425	334	857
No. 11	474	633	—	1,730	654	1,021
No. 12	—	—	—	35	—	—
No. 14	—	—	—	100	—	—
No. 16	—	—	—	78	—	—
Ore-bin access	—	—	—	221	—	—
Lower loading-pocket	—	—	—	—	30	209
Crusher level	—	—	—	—	—	116
Total	2,823	51,204	376	11,976	8,137	97,237

Diamond-drilling in 1960 consisted of 5 holes, totalling 343 feet, and 942 feet of test-hole drilling, from underground.

During the period of operation, a total of 620,530 tons of ore was hoisted, and 631,130 tons was milled; the mill averaged 3,945 tons daily.

The average number of employees was 222: 129 underground, and 93 on surface. G. L. Hatherly was mine manager.

PANEL MINE

Operations at the Panel mine, comprising 36 claims in Township 144, District of Algoma, continued throughout 1960. The mine is being developed through two shafts, which were sunk on two islands close to the north shore of Quirke Lake. The No. 1 island has now been joined to the mainland by a causeway.

SHAFTS, PANEL MINE

Shaft	Claim No.	Inclination	Number of Compartments	Total Depth from Surface
				feet
No. 1 (production)	S.67629	Vertical	6	1,836
No. 2 (ventilation)	S.67630	Vertical	3	1,250

Development work in 1960 consisted of 5,200 feet of drifting, 6,879 feet of crosscutting, and 24,018 feet of raising. Total development footage to 31 December 1960, was as follows: 34,787 feet of drifts; 26,110 feet of crosscuts; 59,923 feet of raises. Diamond-drilling in 1960 consisted of 980 holes, totalling 31,320 feet, from underground.

New equipment installed included a water softener in the boiler-feed line, an incline service installation, and a 110,000-gallon storage for the main water-pumping sytem.

A total of 1,137,087 tons of ore was hoisted, and 1,133,087 tons was milled; the mill averaged 3,098 tons daily.

The average number of employees was 711: 408 underground, and 303 on surface. G. A. Jewett was mine manager; S. Hunter was mine superintendent.

PRONTO DIVISION

The pronto property comprising 139 claims, is located in Long and Spragge townships, District of Algoma. Mining operations continued from 1 January to 5 April; the mill operated from 1 January to 9 April on uranium production. The mine was closed, and a part of the Pronto mill was converted to the production of copper concentrates from the Pater mine. A road was built from the Pater mine to the Pronto mill to reduce truck-haulage distance to about two miles. Further details on the Pater operation are given in the copper section of this report under Rio Algom Mines Limited, Pater mine (*See* p. 102).

SHAFTS, PRONTO MINE

	Claim No.	Inclination	Number of Compartments	Sinking in 1958	Total Depth from Surface
				feet	feet
Adit	S.S.M.23537	26°	——	——	55
No. 1 shaft	S.S.M.23523	Vertical	4	301	974

The following table gives the development footage during the operating period in 1960, and the accumulated footage to the time of closing:

UNDERGROUND DEVELOPMENT PRONTO MINE

Level	Drifts		Crosscuts		Raises	
	1960	Total	1960	Total	1960	Total
	feet	feet	feet	feet	feet	feet
1st	——	3,858	——	2,115	——	832
2nd	——	5,677	——	2,020	——	957
3rd	——	3,110	65	937	——	673
4th	——	4,001	——	470	——	402
5th	——	3,538	——	650	28	737
6th	71	3,456	——	1,680	——	585
7th	——	781	——	2,296	——	1,147
Total	71	24,421	65	10,168	28	5,333

Diamond-drilling in 1960 consisted of 21 holes, totalling 1,643 feet, from underground.

A total of 148,228 tons of ore was hoisted, and 149,528 tons was milled; the mill averaged 1,495 tons daily.

The average number of employees was 154: 85 underground, and 69 on surface. P. E. Young was manager.

The following is taken from the company's annual report for the year ending 31 December 1960:

Ore Reserves (Uranium)

Mine	Proven Ore[1]		Probable Ore			
			As Disclosed by Underground Development[1]		As Disclosed by Diamond Drilling[2]	
	Ore	U_3O_8 per Ton	Ore	U_3O_8 per Ton	Ore	U_3O_8 per Ton
	tons	pounds	tons	pounds	tons	pounds
Nordic	732,621	2.75	579,581	3.04	3,074,000	2.64
Milliken	845,450	2.26	1,170,650	2.17	13,686,000	2.09
Panel	215,345	2.23	1,305,245	2.25	7,058,527	2.30
Shut-down Mines[3]	1,837,715	2.26	1,713,496	2.23	19,762,214	2.41

[1]Includes dilution based on experience.
[2]Tonnages and grades undiluted.
[3]Includes combined tonnages for Spanish, Lacnor, Pronto, and Quirke. The existing tonnages of mineralized material at these mines may be deemed ore reserves only in the event that mining operations at the respective properties are recommenced, since such mineralized material cannot be economically mined by openings from other properties remaining in operation.

Increased knowledge of the orebody structure has made it possible again to recalculate probable ore disclosed by diamond-drilling, eliminating further low-grade ore on the fringe areas and material deemed to be lost in probable dikes, faulting, and pillars.

Costs

The average operating cost per ton of ore milled for 1960, before administrative expense, interest, Ontario mining tax and depreciation, but including shutdown expenses and write-off of obsolete supplies, was $8.64 per ton as against $10.82 per ton for 1959. The reduction was achieved despite wage increases, increased cost of supplies, and certain other continuing expenses incurred under the arrangements for stretching-out production. Had the stretch-out expenses not been necessary, the cost reduction during the year would have been almost $3.00 per ton.

The figures indicate the extent to which increased experience and skills in applying new practices and processes have helped the operations.

Milling

The following table gives the performance at the company's mills for the year 1960, and comparable figures for 1959 and 1958:

Year	Total Milled	Average Daily Milling Rate	Average Calculated Heads (U_3O_8 per Ton)	Average Recovery Based on Heads Average Calculated
	tons	tons	pounds	percent
1960	5,050,004	17,512	2.39	93.5
1959	6,090,675	16,968	2.30	94.2
1958	5,406,985	15,631	2.15	92.4

The total tonnage treated during 1960 was down about 1,000,000 tons, but the average daily throughput for the mills was increased slightly. Of more operating significance is the increase in grade of ore milled, achieved by close supervision and improved techniques of trade control. Milliken, Nordic, and Quirke mills have each had about a year's experience with pebble (or autogenous) grinding, and its superiority over ball-mill grinding has been successfully proved. Important improvements in the leaching circuits were made at all mills by applying the results of an intensive research program. On the other hand, it was found advantageous to reduce the recoveries slightly after balancing the cost of reagents against tailings losses.

All mills operated at or near full capacity during the year, which in some cases was in excess of rated capacity.

General

At the Pronto and Lacnor mines, all mine equipment was brought to the surface, and the workings stripped of usable materials and equipment, which were prepared for storage or sale, or were transferred to other properties. Mill circuits were cleaned out.

The Quirke mine and mill were not dismantled to the same extent, it being the intention to hold this mine in reserve on a stand-by basis.

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 have been issued. The directors and officers were: Hugh Fulton, president and director; D. S. Robertson, vice-president and director; N. C. Steenland, V. V. Jacomini, John Dunning, Harry Merritt, J. C. Ward, and L. T. Norville, directors; George Rowe Jr., vice-president; 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 about 595 acres in Township 144, Blind River area, District of Algoma.

Mining operations continued throughout 1960.

SHAFTS, STANROCK MINE

	Claim No.	Inclination	Number of Compartments	Total Depth
				feet
No. 1 shaft	S.82324	Vertical	3	3,379
No. 2 shaft	S.82323	Vertical	3	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 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 15,328 feet of drifting, 1,030 feet of crosscutting, and 889 feet of raising. Total development footage to 31 December 1960, was as follows: 78,153 feet of drifts; 3,421 feet of crosscuts; 3,370 feet of raises. Some 314 diamond-drill holes, totalling 5,711 feet were completed in 1960 from underground.

New equipment installed underground consisted of a rope suspension conveyor in two sections, both 48 inches wide, one section 1,550 feet long; the second 750 feet long (Goodman); a fan (48-in., 3-stage aerofoil 40,000 cfm., Howard Engineering).

A total of 1,094,618 tons of ore was hoisted; 1,095,395 tons was milled at a daily average of 3,001 tons.

The average number of employees was 732: 448 underground, and 284 on surface. F. R. Jones was mine manager.

ZINC—*see* LEAD AND ZINC

Non-Metallics and Fuels

ARSENIC

In 1960, Deloro Smelting and Refining company shipped 1,724,326 pounds of arsenic trioxide with a value of $70,400. This was recovered in the refining of silver-cobalt concentrates from the ores of the mines in the Cobalt-Gowganda area.

ASBESTOS

Production was down slightly in quantity and value from 1959. The general statistics for asbestos, fluorspar, gypsum, nepheline syenite, peat moss, and talc are grouped together and published here. These industries employed 120 salaried personnel and 401 wage-earners, paying the former $716,086 and the latter $1,887,164. They used fuel and electricity worth $437,350, and process supplies worth $275,932.

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: C. B. Burnett, president and director; L. M. Adamson, F. A. H. Gallop, Roger Hackney, N. W. Hendry, K. W. Huffine, K. V. Lindell, J. A. O'Brien, C. F. Rassweiler, A. G. Sinclair, and J. P. Syme, vice-presidents and directors; H. M. Ball, secretary and director; F. H. May Jr., vice-president; J. M. Schacklford, treasurer; J. L. Jacobs, A. V. Mitchell, S. C. Allard, D. W. Livingstone, and H. J. White, assistant-treasurers; I. J. Pedly, W. H. Soutar, and J. D. Wilson, assistant-secretaries. The head office is at 310 Victoria Avenue, Westmount, Que. The mine address is Matheson.

The company's holdings include 26 claims, known as the Munro mine, in Munro township, and the Barton Creek mine in Beatty township, Porcupine area, District of Cochrane. No work was done at the Barton Creek mine in 1960.

Mining and milling at the Munro mine continued throughout 1960. Operations in the open pit ceased in January 1959, subsequent mill feed coming from the open-pit stockpile and underground mining.

SHAFTS, MUNRO MINE

Shaft	Claim No.	Inclination	Number of Compartments	Sinking in 1960	Depth below Surface
				feet	feet
No. 1 main	Veterans lot P.1152	Vertical	4	——	882
No. 1 service	L.4510	Vertical	3	——	629
No. 3 (below 637-foot level)	L.16365	Vertical	2	71	802

Sinking of No. 3 internal shaft, collared on the 637-foot level in 1959, was advanced a further 71 feet in 1960 to a depth of 802 feet below surface. The 737-foot level was established.

Development work in 1960 consisted of: 4,700 tons of overburden stripped, 3,905 feet of drifting; 2,492 feet of crosscutting; 824 feet of raising. The total development to 31 December 1960, consisted of: 1,842,136 tons of overburden stripped, 25,334 feet of drifting, 15,865 feet of crosscutting, 5,153 feet of raising. Diamond-drilling in 1960 consisted of 75 holes, totalling 13,740 feet, from underground.

Extensive alterations to the milling plant completed near the year's end, will permit the production of an improved grade of asbestos fibre and will increase the daily tonnage treated. The following new equipment was installed:

MILL:
- 10 paddle trommels (58 x 150 ins., Forresteel).
- 3 paddle trommels (38 x 120 ins., Forano).
- 1 hammer mill (Barberton Iron & Steel, Barberton, South Africa).
- 2 gyratory sifters (11-deck, Allis-Chalmers).
- 4 C. V. Smith separators (Lynn, MacLeod Engineering, Thetford Mines, Que.).

CRUSHER BUILDING:
- 1 dryer (ASS-7L Hazemag Company, Munster, W. Germany).
- 1 furnace (gas-fired, 25,000,000 Btu. per hour, Combustion Engineering, Montreal).

HEATER BUILDING:
- 1 mine air heater (gas-fired, 2,000,000 Btu. per hour, Calorific Ltd., Toronto).

MINE:
- 1 pump (500 (US) gpm., No. 1A 8-stage, Plurovane, Mather & Platt, Manchester, England).
- 10 mine cars (2-ton side-dump, Wabi Iron Works, New Liskeard).

PIT:
- 1 pump (650-gpm., No. 6/8, 2-stage Medivane, Mather & Platt, Manchester, England).

There were 268,184 tons of ore hoisted from underground, and 191,519 tons removed from the surface ore stockpile, from which 20,878 tons was discarded. The mill treated 427,500 tons operating at an average daily rate of 1,750 tons.

The average number of employees was 254: 75 underground, and 179 on surface. R. D. Baker 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 1,178,467 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 is at Timmins. The mine address is Matheson, P.O. Box 336.

The property comprises 28 claims located in Warden and Munro townships, District of Cochrane, about 25 miles northeast of Matheson.

A stripping and diamond-drilling program carried out during the year indicated a large tonnage of asbestos-bearing material. Diamond-drilling in 1960 consisted of 28 holes, totalling 9,896 feet, from surface.

The deposit was bulk-sampled. A 100-tons-per-day test mill and a permanent camp were under construction: construction included an office (18 x 30 ft.); shop and garage (28 x 32 ft.); 3 buildings for camp accommodation (14 x 16 ft.); and a power building (14 x 16 ft.).

Equipment purchased included a compressor (Holman Tractair unit, 125-cfm.); a tractor with angledozer (Case, 310); a dump truck (Ford, F-600, 3-ton) and a jaw-crusher (Canadian Allis-Chalmers, 9 x 15 ins.).

W. J. Wark, chief engineer, was in charge of operations, and the average number of employees was 5.

FLUORSPAR

Huntingdon Fluorspar Mines Limited was the only producer in Ontario. Their output was practically the same in value as it was in 1959. For general statistics see ASBESTOS.

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 1960 was as follows: preferred, 750; common, 100,003. The officers and directors were: W. J. Symon, president; Mrs. Alein Symon, vice-president and secretary-treasurer; Mrs. Jane Parker, director. The head office and mine office are at Madoc.

Operations in 1960 were at the Perry Lake mine. This property comprises 200 acres located in Huntingdon township, Hastings county. The mine operated between 14 May and 15 July, the mill between 23 May and 13 July, 1960.

SHAFTS, PERRY LAKE MINE

Shaft	Location	Inclination	Number of Compartments	Sinking	Depth Below Surface
				feet	feet
No. 1	Lot 11, con. XIII, Huntingdon tp.	Vertical	2	——	170
No. 2 (escapeway)		Vertical (in 2 stages)	1	——	68

All development work has been on the 75-foot level. In 1960 there was 65 feet of drifting and 68 feet of raising. Total development footage to 31 December 1960 was as follows: 595 feet of drifts; 180 feet of crosscuts; 68 feet of raises.

A total of 1,987 tons of ore was hoisted, from which 611 tons was discarded. The mill treated 1,376 tons, averaging 30.6 tons daily.

The average number of employees was 11: 3 underground, and 8 on surface. Gordon Gregg was manager.

GARNET

In 1960, Industrial Garnet Company Limited operated for about 10 days in their quarry at River Valley. They produced 32 tons of garnet, which was used chiefly in polishing granite. Two tons were shipped to a manufacturer of abrasives in the United States.

GYPSUM

Canadian Gypsum Company Limited and Gypsum Lime and Alabastine Limited operated throughout the year in Haldimand county. Production decreased 13.71 percent in quantity and 14.34 percent in value from 1959. For general statistics see ASBESTOS.

Canadian Gypsum Company Limited

Canadian Gypsum Company Limited was incorporated in September 1907. The authorized capitalization is 3,000 shares of $100 par value, of which 2,710 shares have been issued. The directors and officers were: G. J. Morgan, president and director; F. L. Stellner, secretary, treasurer, and director; G. A. Long, Edward Rembert, H. F. Sadler, C. H. Shaver, and J. E. MacLeish, directors. The head office is at Windsor, Nova Scotia; the main 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 owns or holds the mining rights on about 2,000 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 1960.

During the year, plant improvements were made. A new underground power station was installed in the southeast section of the mine, and underground transportation facilities for personnel were established.

A total of 213,832 tons of ore was hoisted; 210,824 tons was milled, the mill averaging 864 tons daily.

The average number of employees, excluding the mill, was 61: 45 underground, and 16 on surface. C. F. Gloeckner was works manager.

Gypsum, Lime and Alabastine Limited

Gypsum, Lime and Alabastine Canada Limited was incorporated in July 1927, with an authorized capitalization of 500,000 shares of no par value. In May 1956, the capitalization was increased to 1,000,000 shares. In February 1959, the name was changed to Gypsum, Lime and Alabastine Limited, and the company became a subsidiary of Dominion Tar and Chemical Company Limited. The head office is at 2240 Sun Life Building, Montreal 2, Quebec. 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 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 1960. The room-and-pillar method of mining is used, which consists of rooms or pockets, leads, and crosscuts, all about 21 feet wide and 8½ feet high. 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 1960 was 10,893 feet. Three diamond-drill holes totalling 460 feet were completed from surface.

New equipment added in 1960 included the following:

1 loader (Model 11-BU-14, Joy Mfg. Co.).
2 shuttle cars (E-60-E-12, Joy Mfg. Co.).
1 tractor (Mercedes Benz, Unimog).
2 storage bins (steel, 200-ton capacity, with screws and conveyors).

During the year a total of 142,865 tons of ore was hoisted; 118,232 tons was milled, the mill averaging 525 tons daily.

The average number of employees, excluding the mill, was 28: 26 underground, and 2 on surface. C. L. Dryden was general manager; Gordon Hunt was mine superintendent.

MICA

In 1960, 345,777 pounds of amber mica, valued at $5,745, was produced in Ontario. With the exception of 400 pounds of trimmed sheets, all was classified as scrap for grinding. The operations were all carried out by individuals, and there are no figures for employment or supplies used.

MINERAL WATER

There was one operator, Breuvages Excel Ltée. in Russell county near Ottawa. They processed 2,626 gallons valued at $1,890. There are no figures available for the labour or process supplies involved.

NATURAL GAS AND PETROLEUM

In this report a different method of evaluating natural gas has been adopted, value being assessed at the wellhead instead of at retail level as in previous years. This new method keeps the Ontario value in line with the value in other gas producing provinces. The volume of gas produced increased slightly—0.88 percent over 1959.

Petroleum production increased 0.40 percent in quantity, but decreased 1.38 percent in value.

Complete information regarding these industries is given in the 1960 report of Ontario Department of Energy Resources.

NEPHELINE SYENITE

Production of this mineral increased 5.21 percent over 1959, but decreased 1.37 percent in value. General statistics are given under ASBESTOS.

American Nepheline Limited

American Nepheline Limited was incorporated in January 1945 with an authorized capitalization of 4,500,000 shares of 50 cents par value, of which 4,100,000 shares have been issued. The directors and officers were: W. H. Woods, president and director; C. J. Koenig, C. R. Archibald, F. D. Hart, M. F. Goudge, directors; J. J. Mather, executive vice-president; H. R. Deeth, vice-president (marketing); D. D. Anderson, secretary; J. T. McWhirter, treasurer. The head office is 25 King Street West, Toronto. The mine address is Nephton, via Lakefield.

The property, consisting of about 200 acres, is located in concession IX, Methuen township, Peterborough county.

Operations continued throughout 1960 in the open pit on the Cabin Ridge section of the property. Surface trenching, some 300 feet in length and averaging 2 feet in depth, was completed.

A total of 180,867 tons of ore was mined, of which 100 tons was discarded. The mill treated 181,813 tons, averaging 770 tons daily.

The average number of employees was 95: 79 in the plant, and 16 in the pit. E. B. Wright was resident manager.

International Minerals and Chemical Corporation (Canada) Limited (Canadian Flint and Spar Department)

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, Ill., 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; N. C. White and Louis Ware, directors; C. M. Edwards, secretary; R. A. Lenon, treasurer and controller; B. R. Carlson, assistant controller; C. E. Gable and J. W. York, assistant secretaries; W. H. Wood, general manager. The head office is at 77 Metcalfe Street, Ottawa. The mine address is Box 158, Havelock.

The company owns six claims, about 400 acres, in Methuen township, Peterborough county. 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 1960.

New equipment installed included: a 9-inch screw conveyor in penthouse for dust collection; a screen (Hummer, 10 x 4 ft., double-deck); a slurry pump and line; and a steam cleaner.

The open-pit operation produced 140,204 tons of ore. The mill treated 101,611 tons, averaging 320 tons daily.

The average number of employees was 48: 40 in the plant, and 8 in the pit. L. F. McDonnell was general superintendent.

PEAT MOSS

Atkins and Durbrow (Erie) Limited operated in Welland county. They gathered material from 1 May to 12 November and operated their processing plant from 3 March to 12 November. The product was used chiefly for horticultural purposes. Production was up 24.17 percent in quantity and 14.63 percent in value from 1959. For general statistics see ASBESTOS.

PETROLEUM—*see* NATURAL GAS AND PETROLEUM

QUARTZ

The International Nickel Company of Canada Limited and Falconbridge Nickel Mines Limited produced, from their own pits and quarries, 1,587,000 tons of quartz and fluxing sand for use in their smelter operations.

Canadian Silica Corporation Limited operated their plant at Whitby throughout the year, their quarry on Manitoulin Island from 16 May to 13 July, and their plant on Manitoulin Island from 16 May to 30 June.

Union Carbide Canada Limited, Metals and Carbon Division, operated their quarry in Killarney township from 14 May to 5 August, and their mill from 18 May to 18 July.

Most of the production of these two operators was used in the manufacture of ferro-silicon.

The industry paid $32,167 to 9 salaried employees and $118,229 to 60 wage-earners, and used fuel and electricity worth $51,222, and process supplies worth $78,932.

SALT

The quantity of salt produced decreased 0.93 percent from the 1959 amount, but the value was 5.78 percent greater.

The industry paid $616,268 to 113 salaried employees, and $2,028,213 to 430 wage-earners. Fuel and electricity used cost $723,651, and process supplies used cost $1,021,961.

Brine operations were carried out throughout the year by Brunner Mond Canada Limited, Canadian Brine Limited, and Canadian Salt Company Limited, in Essex county; at Sarnia by Dow Chemical of Canada Limited, and at Goderich and Sarnia by Sifto Salt Limited.

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 3,140 shares have been issued. The directors and officers were: Daniel Peterkin Jr., president and director; N. C. Hobson, executive vice-president and director; J. H. Burtch and W. D. Mahaffy, vice-presidents and directors; F. B. Common Jr., H. R. Milner, E. G. Smith, F. H. Sobey, L. M. McBride, H. R. Stratford, and R. C. Vail, directors; H. A. Clarke, secretary-treasurer. The head office is at 30 Prospect Avenue, Windsor. The mine address is Ojibway.

The company's property is in concession I, Sandwich West township, Essex county, on the shore of the Detroit River.

Operations continued throughout 1960.

SHAFTS, CANADIAN ROCK SALT MINE

	Inclination	Number of Compartments	Total Depth
			feet
No. 1 shaft	Vertical	4	1,082
No. 2 shaft	Vertical	3	1,025

Production remained at a fairly high level throughout the year, with seasonal peaks in the first and last quarters. The Ojibway mine, which produces rock salt for both the domestic and export markets, continued its program of expanding auxiliary equipment for bag handling, and boxcar and truck loading, as well as underground screening and ventilation.

The conveyor system handling the bagged product has been extended and modified to accelerate the loading cycle. Two new boxcar stations and one truck-loading station have been installed, with the accompanying track and truck scales. A conveyor system to handle the stored product from outside to inside storage and to loading-stations has been brought into operation.

The underground auxiliary screening system used to size a part of the product before it is hoisted, was completed in the last quarter of the year. The new ventilation system has been completed; this has one fan on the surface at No. 1 shaft and a second fan at the bottom of No. 2 shaft, to assure two completely separate and interchangeable sources of air. Arrangements are such that a second fan may be installed in either or both locations as required.

The underground development pattern of room-and-pillar advance has been maintained with a 50-percent recovery factor. Underground machine shops and electrical shops have been relocated in a central position to service the conveying,

loading, and transportation equipment for some years to come. The third 1,000-kva. transformer has been installed underground to supply No. 1 and No. 2 shaft facilities, as well as the new ventilation and screening arrangements.

Development work in 1960 consisted of 5,350 feet of drifting, 6,400 feet of crosscutting, and 12,845 feet of rooms. Total development footage to 31 December 1960, was as follows: 30,950 feet of drifts; 21,700 feet of crosscuts; 58,075 feet of rooms.

A total of 927,430 tons of salt was hoisted and milled. The mill treated a daily average of 3,709 tons.

The average number of employees was 166: 86 underground, and 80 on surface. W. M. Rice was mine manager.

Sifto Salt (1960) Limited

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; and in 1960, to Sifto Salt (1960) Limited. The company is a wholly-owned subsidiary of Dominion Tar and Chemical Company Limited. The authorized capitalization is 100,000 shares of no par value, of which 25,000 shares have been issued. D. S. Thomas and S. A. Kerr are directors. The head office and mine offices are at Goderich.

Operations continued throughout 1960.

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. During the latter part of the year, the large drill jumbo was put into operation, and excavations have now been increased to a height of 45 feet. Pillars are 210 feet square, giving an extraction ratio of 40 percent.

It is proposed to install complete crushing and screening equipment underground early in 1961, and excavations were started during the year to accomodate this equipment. Salt will also be stored underground with provision for conveyor reclaiming.

Additional underground equipment was put into service. This mainly consisted of two rock wagons (Michigan 25-ton), two loaders (Jeffrey Crawler), an undercutter (Joy 15RU), a front-end loader (Michigan Model 175), and a Trump giraffe.

Ventilation was augmented by the installation of an additional fan on surface. This is operated in series with an identical underground unit having a capacity of 150,000 cfm. A mine-air heating unit, rated at 2,000,000 Btu. per hour, was installed early in the year.

Development footage in 1960 consisted of 10,389 feet of drifting, 166 feet of which was for ventilation. Total development footage to 31 December 1960 was as follows: 11,781 feet of drifts; 108 feet of raises.

A total of 639,440 tons of ore was hoisted and milled. The average daily milling rate was 1,752 tons.

The average number of employees was 92: 60 underground, and 32 on surface. W. G. Muir was mine manager.

SULPHUR

The value of sulphur produced in 1960 was 5.38 percent less than that of 1959. Some elemental sulphur is produced in Ontario, but the greater part of the value given represents the value of the sulphur content of sulphuric acid and liquid sulphur dioxide produced from smelter gases.

The sulphur is a byproduct of the mines in the Sudbury and Manitouwadge areas.

The general statistics for the production of this mineral are included under NICKEL AND COPPER.

TALC

Production decreased 18.27 percent in quantity and 18.47 percent in value from 1959. The general statistics for this mineral industry will be found under ASBESTOS.

Canada Talc Industries Limited

Canada Talc Industries Limited was incorporated in July 1951, with an authorized capitalization of 1,000,000 shares of no par value of which 850,007 shares have been issued. The officers are: H. L. Roscoe, president; N. C. Urquhart, vice-president; C. H. Windeler, secretary-treasurer. The head office and mine office are at Madoc.

The company's property in Huntingdon, Elzevir, and Madoc townships, Hastings county, includes the Conley and Henderson mines.

Operations continued throughout 1960. 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 tp. 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 tp. lot 14, con. XIV	Vertical	2	456

Development work in 1960 consisted of 600 feet of drifting and 90 feet of crosscutting. Total development footage to 31 December 1960 was as follows: 13,679 feet of drifts, 4,117 feet of crosscuts, 3,768 feet of raises. Some 22 diamond-drill holes, totalling 2,697 feet, were completed from underground.

A total of 10,499 tons of ore was hoisted: 3,815 tons was sold as crude talc; 6,684 tons was milled at an average of 50 tons daily.

The average number of employees was 17: 9 underground, and 8 on surface. H. E. Roscoe was manager.

Structural Materials

CEMENT

Production decreased 15.89 percent in quantity and 3.26 percent in value from 1959.

Canada Cement Company Limited operated quarry and plant at Point Anne throughout the year, and quarry and plant at Port Colborne from 1 May to 18 November. The plant at Woodstock operated throughout the year, and the quarry operated throughout the year with the exception of the period from 23 February to 27 April.

Quarries and plants were operated for the whole year by Lake Ontario Portland Cement Company Limited at Picton, St. Lawrence Cement Company at Clarkson, and St. Mary's Cement Company Limited at St. Mary's.

The industry employed 179 salaried personnel and paid them $1,168,331, and 875 wage-earners who were paid $4,258,687. Their operations used fuel and electricity valued at $5,819,852, and process supplies valued at $1,232,622.

CLAY PRODUCTS

The value of clay products decreased by 8.95 percent from 1959. There were 49 operators with 53 plants. They employed 192 salaried personnel and 1,613 wage-earners; paid the former $1,031,302 and the latter $5,935,300. They used fuel and electricity worth $3,181,793, and process supplies worth $569,756.

CLAY PRODUCTS MARKETED, 1960

Kind		Quantity	Value
Brick:			
Soft-mud process	face M	8,166	$ 494,174
	common M	1,031	29,037
Stiff-mud (wire-cut) process	face M	173,312	9,922,941
	common M	30,290	974,315
Dry-press	face M	23,883	1,317,099
	common M	1,316	27,766
Fancy or ornamental brick (including special shapes, embossed and enamelled brick)	M	590	81,459
Sewer	M	1,061	42,496
Paving brick	M	502	49,353
Tile:			
Structural (hollow blocks, including fireproofing and load-bearing tile)	tons	53,833	1,783,596
Floor tile (quarries)	sq. ft.	178,661	85,035
Drain	M	51,637	2,954,594
Sewer pipe	feet	2,557,000	1,238,500
Pottery from domestic clay		—	538,741
Flue linings	feet	781,528	580,287
Haydite		—	450,723
Other products		—	321,209
Total		—	$20,191,325

LIME

Production of quicklime decreased 11.68 percent in value, and that of hydrated lime decreased 15.51 percent in value from the 1959 amounts for these products. There were 11 producers with 14 operating plants, and 51 kilns in use. They paid $271,302 to 57 salaried employees, and $1,940,088 to 488 wage-earners, used fuel and electricity worth $2,568,142, and process supplies worth $291,998.

The following operated throughout the year:

Bonnechere Lime Limited, Grattan township, Renfrew county.
Brunner Mond Canada Limited, Amherstburg.
Canadian Gypsum Company Limited, Guelph.
Carleton Lime Products Company, Carleton Place.
Chemical Lime Limited, Ingersoll.
Cobo Minerals Limited, Coboconk.
Cyanamid of Canada Limited, Ingersoll.
Cyanamid of Canada Limited, Niagara Falls.
Dominion Magnesium Limited, Haley.
Gypsum Lime and Alabastine Limited, Beachville.
Gypsum Lime and Alabastine Limited, Hespeler.
Gypsum Lime and Alabastine Limited, Milton.
Rockwood Lime Company Limited, Rockwood.

Canada and Dominion Sugar operated for 66 days at the Chatham kiln.

LIME, 1960

Industrial Consumption	Quicklime		Hydrated Lime	
	Quantity	Value	Quantity	Value
	tons		tons	
Building trades, finishing, and masonry	16,720	$ 275,564	81,168	$1,698,386
Agriculture	104	1,198	775	10,369
Industry:				
Smelters	6,288	79,305	3,983	55,328
Iron and steel	150,018	1,709,909	2,337	31,348
Gold-milling	6,847	88,133	1,161	15,936
Uranium milling	206,898	2,524,272	——	——
Pulp and paper	20,701	235,063	1,286	18,667
Glass	14,709	194,889	——	——
Sugar	5,307	43,118	——	——
Tanneries	734	8,664	3,031	41,909
Fertilizers and insecticides	50	813	1,111	21,852
Chemical industries	440,460	4,864,593	449	9,971
Other consumers	16,902	217,291	9,049	132,052
Total	885,738	$10,242,812	104,350	$2,035,818

SAND AND GRAVEL

Production increased 4.97 percent in quantity and 10.66 percent in value over the 1959 production. There were 344 reporting pit operators and 9 dredge operators. The industry employed 264 salaried persons and paid them $1,261,820, and 1,786 wage-earners and paid them $6,749,955. Fuel and electricity used cost $2,093,323, and process supplies used cost $437,900.

OUTPUT OF SAND AND GRAVEL

Source		1956	1957	1958	1959	1960
Private pit operators	tons	29,583,879	32,134,104	31,853,372	34,559,281	34,670,825
	$	19,595,413	21,100,962	23,514,262	24,520,143	24,254,713
Dredged from the Great Lakes and rivers	tons	1,570,836	1,862,920	1,263,381	1,306,943	1,163,678
	$	1,649,841	1,742,507	1,421,628	1,616,294	1,490,251
Ontario Department of Highways	tons	18,250,000	19,537,000	21,077,081	24,776,179	26,303,751
	$	7,610,000	7,808,000	8,460,000	7,226,546	10,521,500
Counties and townships	tons	10,309,882	10,455,849	11,816,303	11,919,781	14,281,959
	$	5,154,941	5,227,925	5,908,152	5,959,891	7,140,980
Railway ballast	tons	1,721,766	2,139,285	1,458,927	1,419,519	1,240,620
	$	368,820	820,501	750,989	372,728	522,264
Total	tons	61,436,363	66,129,158	67,469,064	73,981,703	77,660,833
	$	34,379,015	36,699,895	40,055,031	39,695,602	43,929,708

STONE

Production of stone increased 3.76 percent in quantity and 5.30 percent in value over the 1959 production. There were 82 reporting operators working in about 93 quarries. The industry paid $1,177,776 to 243 salaried personnel, and $4,977,691 to 1,288 wage-earners. Fuel and electricity used cost $1,385,536, and process supplies cost $2,261,963.

There were 2,451,300 tons of limestone quarried for the manufacture of cement, and 1,681,723 tons for the manufacture of lime. These amounts are not included in the year's totals of stone production; this is done in order to avoid duplication of reporting of mineral material in the statistics of production.

OUTPUT OF STONE

Variety		1956	1957	1958	1959	1960
Limestone	tons	15,207,534	16,592,404	15,144,361	16,322,071	16,118,571
	$	18,941,565	19,748,013	18,542,922	19,363,443	18,782,082
Marble	tons	34,178	40,328	33,989	51,440	40,423
	$	267,486	298,496	301,135	327,644	356,762
Trap and granite	tons	445,072	719,026	550,362	882,236	1,695,446
	$	1,132,614	1,605,542	1,265,996	1,811,344	3,631,262
Sandstone	tons	47,880	38,680	27,848	33,049	84,143
	$	479,062	543,764	560,427	550,994	450,553
Total	tons	15,734,664	17,390,438	15,756,560	17,288,796	17,938,583
	$	20,820,727	22,195,815	20,670,480	22,053,425	23,220,659

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