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Box #2



ONTARIO
DEPARTMENT OF MINES

HON. G. C. WARDROPE, *Minister*

D. P. DOUGLASS, *Deputy Minister*

**Statistical Review of the Mineral Industry and
Mining Operations for 1961**

By

T. J. KELLY and G. S. RIDDELL

Annual Report for the Year 1961

Volume 71

TORONTO

Printed and Published by Frank Fogg, Printer to the Queen's Most Excellent Majesty
1963

INTRODUCTORY LETTER

TO THE HONOURABLE G. C. WARDROPE
Minister of Mines

Sir: The undersigned has the honour to submit to you the Seventy-first 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, 1963.

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Statistical Review of the Mineral Industry and Mining Operations for 1961

By

T. J. Kelly¹ and G. S. Riddell²

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

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

GENERAL SUMMARY

MINERAL PRODUCTION

The value of mineral production in Ontario in 1961 decreased 3.69 percent from that of 1960. This was the first time since 1946 that there has been a decrease from the previous year's total. The 1961 production value is the third highest in the history of the mining industry of the province: it is 18.16 percent greater than the production of 1958, the fourth highest place holder, and nearly four times greater than that of the year 1947, when Ontario's mineral production value began its steady climb. Decreased activity in the uranium mining industry is responsible for the greatest part of the decline. Gains were made in the values of gold, iron ore, nickel, zinc, and structural materials; there was a slight decrease in the value of copper produced, and decreases in the production values of cobalt, platinum metals, and silver.

The value of the metallics produced in the Sudbury district was 56.64 percent of the total for the province. The Blind River area accounted for 17.67 percent, Rainy River and Kenora for 5.71, the Porcupine area for 5.14, Thunder Bay for 4.69, the Kirkland Lake and Larder Lake area for 3.75, Eastern Ontario for 3.49, Algoma for 2.04, and the Cobalt area for 0.87 percent.

The value of metallic minerals decreased 4.62 percent from 1960; the value of non-metallics decreased 4.18 percent; and the value of structural materials increased 2.23 percent.

Metallic minerals accounted for 82.47 percent of the total value of production, non-metallics for 3.46 percent, and structural materials for 14.07 percent.

During the year the metal mines paid out \$93,843,370 in dividends.

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

¹Statistician, Ontario Department of Mines.

²Engineer of Mines, Ontario Department of Mines.

SUMMARY OF MINERAL STATISTICS, 1961

| Product | Quantity | Value | Wage-Earners ⁽¹⁾ | Wages |
|--|-----------------|---------------|-----------------------------|---------------|
| METALLICS | | | | |
| Gold | 2,637,720 oz. | \$ 93,533,551 | 10,105 | \$ 38,974,672 |
| Silver | 8,870,402 oz. | 8,561,240 | 496 | 1,944,456 |
| Copper in matte exported | 38,044,357 lb. | 9,967,622 | | |
| Copper, metal and concentrates | 385,249,190 lb. | 112,454,238 | | |
| Nickel, matte, metal and salts | 392,435,773 lb. | 295,423,149 | 19,420 | 97,904,617 |
| Platinum metals | 418,278 oz. | 24,534,349 | | |
| Selenium | 164,800 lb. | 1,071,200 | | |
| Tellurium | 8,050 lb. | 39,043 | | |
| Cobalt, metal and salts | 2,884,420 lb. | 4,309,912 | (2) | |
| Iron ore | 5,772,664 tons | 62,350,773 | 1,863 | 10,031,778 |
| Calcium | 99,355 lb. | 100,881 | | |
| Magnesium | 15,270,618 lb. | 4,307,570 | | |
| Lead | 1,670,535 lb. | 170,562 | | |
| Zinc | 103,874,146 lb. | 13,077,755 | 653 | 3,421,325 |
| Uranium (U ₃ O ₈) | 14,970,593 lb. | 151,060,610 | 3,847 | 21,151,391 |
| Bismuth | 19,923 lb. | 22,388 | (3) | |
| Total | — | \$780,784,843 | 36,384 | \$173,428,239 |

NON-METALLICS AND FUELS

| | | | | |
|----------------------------|----------------------|------------|---------------|---------------|
| Arsenic trioxide | 419,300 lb. | \$ 16,772 | (3) | |
| Mica, amber | 192,540 lb. | 14,332 | | |
| Mica, white | 420 lb. | 630 | | |
| Mineral water | 6,985 gals. | 2,786 | | |
| Natural gas | 14,544,165 M cu. ft. | 5,614,048 | | |
| Petroleum | 1,149,087 bbls. | 3,546,740 | | |
| Quartz | 1,540,016 tons | 827,061 | not available | not available |
| Salt | 2,861,705 tons | 13,586,373 | 42 | \$ 192,376 |
| | | | 427 | 1,998,709 |

| | | | | |
|------------------------------|---------|--------------|-----|-------------|
| Sulphur ⁽⁴⁾ | 25,047 | 855,058 | (5) | _____ |
| Asbestos..... tons | _____ | 4,362,668 | | _____ |
| Fluorspar..... tons | 80 | 38,400 | | _____ |
| Garnet..... tons | 425,287 | 991,944 | 483 | 2,182,265 |
| Gypsum..... tons | 240,320 | 2,572,169 | | |
| Nepheline syenite..... tons | 15,113 | 251,352 | | |
| Peat moss..... tons | 7,417 | 107,660 | | |
| Talc..... tons | _____ | _____ | | _____ |
| Total..... | _____ | \$32,791,193 | 952 | \$4,373,350 |

STRUCTURAL MATERIALS

| | | | | |
|--|------------|---------------|--------|---------------|
| Cement..... tons | 2,226,923 | \$ 35,671,569 | 836 | \$ 4,309,782 |
| Hydrated lime..... tons | 104,345 | 1,975,403 | 356 | 1,617,019 |
| Quicklime..... tons | 760,785 | 9,572,729 | 1,738 | 6,492,300 |
| Sand and gravel..... tons | 75,084,320 | 43,201,211 | 1,237 | 4,807,360 |
| Stone..... tons | 17,612,804 | 23,027,084 | | |
| Clay Products: | | | | |
| Brick, face..... M | 199,731 | 11,380,338 | | |
| Brick, common..... M | 34,569 | 1,064,652 | | |
| Brick, fancy and ornamental, special glazes..... M | 475 | 70,328 | | |
| Brick, sewer..... M | 996 | 42,100 | 1,583 | 5,850,387 |
| Tile, drain..... M | 48,479 | 2,686,550 | | |
| Tile, structural, roofing, and floor..... | _____ | 1,734,892 | | |
| Sewer pipe, copings, flue-linings, etc..... | _____ | 1,757,766 | | |
| Miscellaneous..... | _____ | 1,037,662 | | |
| Total..... | _____ | \$133,222,284 | 5,750 | \$ 23,076,848 |
| Grand Total..... | _____ | \$946,798,320 | 43,086 | \$200,878,437 |

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

COMPARATIVE OUTPUT AND VALUE OF MINERAL PRODUCTION

| Product | 1957 | 1958 | 1959 | 1960 | 1961 |
|-----------------|--------------------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| METALLICS | | | | | |
| Bismuth | lb. \$ 14,214 21,372 | 18,581 26,779 | 31,457 37,748 | 37,835 45,402 | 19,923 22,388 |
| Calcium | lb. \$ 221,225 282,378 | 25,227 31,256 | 67,429 76,409 | 134,801 159,241 | 99,355 100,881 |
| Cobalt | lb. \$ 3,750,596 7,541,258 | 2,436,064 4,866,767 | 2,835,684 5,414,246 | 3,258,401 6,312,921 | 2,884,420 4,309,912 |
| Copper | lb. \$ 343,406,269 98,488,877 | 284,069,476 71,267,895 | 376,544,371 110,547,037 | 412,544,528 123,750,235 | 423,293,547 122,421,860 |
| Gold | oz. \$ 2,578,206 86,621,067 | 2,716,514 92,192,231 | 2,683,449 90,083,383 | 2,732,673 92,774,248 | 2,637,720 93,533,551 |
| Iron Ore | tons \$ 4,867,105 41,317,629 | 3,644,952 36,851,421 | 6,018,089 50,830,404 | 5,325,197 48,399,442 | 5,772,664 62,350,773 |
| Lead | lb. \$ 1,012,565 141,354 | 2,513,224 285,502 | 3,222,447 341,902 | 1,661,896 177,490 | 1,670,535 170,562 |
| Magnesium | lb. \$ 15,184,373 4,767,043 | 9,087,362 2,747,755 | 8,144,940 2,202,392 | 14,577,138 4,313,987 | 15,270,618 4,307,570 |
| Nickel | lb. \$ 354,792,843 243,518,138 | 254,286,784 177,168,918 | 347,929,183 240,053,265 | 403,300,283 277,924,234 | 392,435,773 295,423,149 |
| Platinum metals | oz. \$ 416,147 25,731,333 | 300,458 14,321,443 | 328,091 16,932,178 | 483,585 28,871,955 | 418,278 24,534,349 |
| Pyrrhotite | tons \$ 264,141 685,335 | 279,422 655,569 | 632,140 | 762,661 | — |
| Selenium | lb. \$ 86,459 951,049 | 90,295 677,213 | 101,400 709,800 | 144,500 1,011,500 | 164,800 1,071,200 |

| | | | | | | |
|--|-----|-------------|-------------|-------------|-------------|-------------|
| Silver | oz. | 6,910,130 | 9,815,257 | 10,540,856 | 11,220,823 | 8,870,402 |
| | \$ | 6,034,598 | 8,529,142 | 9,252,763 | 9,976,434 | 8,361,240 |
| Tellurium | lb. | 6,915 | 6,692 | 6,900 | 7,450 | 8,050 |
| | \$ | 12,101 | 11,376 | 14,835 | 26,075 | 39,043 |
| Thorium | lb. | — | — | 47,447 | (1) | (1) |
| | \$ | — | — | 105,676 | (1) | (1) |
| Uranium (U ₃ O ₈) | lb. | 7,970,598 | 19,970,136 | 25,492,171 | 19,793,727 | 14,970,593 |
| | \$ | 82,940,763 | 210,149,700 | 268,529,993 | 211,983,533 | 151,060,610 |
| Zinc | lb. | 22,591,677 | 92,478,339 | 89,963,215 | 90,459,368 | 103,874,146 |
| | \$ | 2,731,334 | 10,061,643 | 11,011,498 | 12,076,326 | 13,077,755 |
| Total Value | \$ | 601,785,629 | 629,844,610 | 806,775,669 | 818,565,684 | 780,784,843 |

NON-METALLICS

| | | | | | | |
|------------------|-------|-----------|-----------|-----------|-----------|-----------|
| Arsenic trioxide | lb. | 3,697,317 | 2,323,320 | 1,578,307 | 1,724,326 | 419,300 |
| | \$ | 137,112 | 94,542 | 63,786 | 70,400 | 16,772 |
| Asbestos | tons | 20,947 | 21,650 | 24,350 | 23,284 | 25,047 |
| | \$ | 3,529,570 | 3,849,370 | 4,327,628 | 4,128,920 | 4,362,668 |
| Fluorspar | tons | 2,430 | 1,256 | — | — | — |
| | \$ | 94,239 | 57,834 | 100,594 | 100,811 | 38,400 |
| Garnet | tons | — | — | — | 32 | 80 |
| | \$ | — | — | — | 4,480 | 3,200 |
| Gypsum | tons | 379,621 | 425,733 | 412,100 | 355,603 | 425,287 |
| | \$ | 853,199 | 1,059,590 | 1,017,340 | 871,408 | 991,944 |
| Mica, amber | lb. | 74,429 | 17,590 | 35,433 | 345,777 | 192,540 |
| | \$ | 2,332 | 736 | 531 | 5,745 | 14,332 |
| Mica, white | lb. | 16,487 | 6,961 | 325 | — | 420 |
| | \$ | 3,941 | 1,370 | 428 | — | 630 |
| Mineral water | gals. | 2,500 | 2,433 | 3,025 | 2,626 | 6,985 |
| | \$ | 2,012 | 1,946 | 1,936 | 1,890 | 2,786 |

(1) Not available

COMPARATIVE OUTPUT AND VALUE OF MINERAL PRODUCTION—Continued

| Product | 1957 | 1958 | 1959 | 1960 | 1961 |
|--------------------------------|---------------------------------------|--------------------------|--------------------------|-------------------------|-------------------------|
| NON-METALLICS—Continued | | | | | |
| Natural gas | M cu. ft. 14,400,913 15,985,013 | 16,147,986 17,760,000 | 16,839,236 16,335,742 | 16,987,056 6,573,990 | 14,544,165 5,614,048 |
| Nepheline syenite | tons 200,016 2,754,060 | 201,306 2,613,446 | 228,722 2,930,932 | 240,636 2,891,095 | 240,320 2,572,169 |
| Peat moss | tons 4,720 220,232 | 6,123 216,055 | 10,925 295,390 | 13,566 338,614 | 15,113 251,352 |
| Petroleum, crude | bbls. 623,666 2,160,000 | 778,341 2,623,000 | 1,001,580 3,194,000 | 1,005,030 3,150,065 | 1,149,087 3,546,740 |
| Quartz and quartzite | tons 1,591,091 1,428,400 | 922,599 666,275 | 1,600,352 1,363,541 | 1,659,410 998,281 | 1,540,016 827,061 |
| Silica brick | M 2,902 291,412 | 1,740 187,061 | 1,123 114,684 | — — | — — |
| Salt | tons 1,538,805 9,478,587 | 2,126,483 10,204,472 | 3,036,230 13,228,977 | 3,007,599 13,994,545 | 2,861,705 13,586,373 |
| Sulphur ⁽¹⁾ | tons 54,264 542,846 | 622,619 | 1,041,857 | 985,717 | 855,058 |
| Talc and soapstone | tons 11,236 160,015 | 8,725 125,511 | 8,796 125,903 | 7,189 102,645 | 7,417 107,660 |
| Total Value | \$ 37,642,970 | \$ 40,083,827 | \$ 44,143,269 | \$ 34,218,606 | \$ 32,791,193 |
| STRUCTURAL MATERIALS | | | | | |
| Portland cement | tons 2,211,887 33,505,994 | 2,400,158 35,195,552 | 2,386,334 31,731,767 | 2,007,044 30,699,800 | 2,226,923 35,671,569 |
| Lime, hydrated, and quicklime | tons 766,143 9,416,868 | 1,009,916 12,644,925 | 1,130,055 14,006,532 | 990,088 12,278,630 | 865,130 11,548,132 |

| | | | | | | |
|-----------------|------|-------------|-------------|-------------|-------------|-------------|
| Sand and gravel | tons | 66,129,158 | 67,469,064 | 73,981,703 | 77,660,833 | 75,084,320 |
| | \$ | 36,699,895 | 40,055,031 | 39,695,602 | 43,929,708 | 43,201,211 |
| Sand-lime brick | \$ | 441,086 | | | | |
| Stone | tons | 17,390,438 | 15,756,560 | 17,288,796 | 17,938,583 | 17,612,804 |
| | \$ | 22,195,815 | 20,670,480 | 22,053,425 | 23,220,659 | 23,027,084 |
| Total Value | \$ | 102,259,658 | 108,565,988 | 107,487,326 | 110,128,797 | 113,447,996 |

CLAY PRODUCTS

| | | | | | | |
|--|----|-------------|-------------|-------------|-------------|-------------|
| Face brick | M | 212,764 | 254,453 | 249,554 | 205,361 | 199,731 |
| | \$ | 11,761,223 | 14,608,555 | 14,441,307 | 11,734,214 | 11,380,338 |
| Common brick | M | 19,432 | 17,978 | 21,420 | 33,138 | 34,569 |
| | \$ | 474,546 | 591,662 | 547,260 | 1,080,471 | 1,064,652 |
| Fancy and ornamental brick, special glazes | M | 255 | 450 | 291 | 590 | 475 |
| | \$ | 29,428 | 52,820 | 34,092 | 81,459 | 70,328 |
| Sewer brick | M | 1,109 | 1,091 | 1,205 | 1,061 | 996 |
| | \$ | 44,563 | 47,923 | 48,185 | 42,496 | 42,100 |
| Drain tile | M | 41,013 | 49,163 | 44,483 | 51,637 | 48,479 |
| | \$ | 2,407,912 | 2,909,168 | 2,595,721 | 2,934,594 | 2,686,550 |
| Tile, structural, roof, etc. | \$ | 1,100,457 | 990,159 | 1,138,045 | 1,168,631 | 1,734,892 |
| Sewer pipe, copings, flue linings, etc. | \$ | 1,680,140 | 2,624,679 | 2,317,028 | 1,238,500 | 1,757,766 |
| Pottery and other products | \$ | 854,682 | 961,325 | 1,053,257 | 1,440,237 | 1,037,662 |
| Haydite and clay | \$ | 348 | | | 450,723 | |
| Total Value | \$ | 18,353,299 | 22,786,291 | 22,174,895 | 20,191,325 | 19,774,288 |
| GRAND TOTAL | \$ | 760,041,556 | 801,280,716 | 980,581,159 | 983,104,412 | 946,798,320 |

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

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TOTAL MINERAL PRODUCTION

| Year | Metallics | Non-Metallics | Structural Materials | Clay Products | Total |
|------------|------------------|---------------|----------------------|---------------|------------------|
| To 31 Dec. | | | | | |
| 1956..... | \$ 7,430,449,967 | \$565,054,108 | \$ 961,331,846 | \$296,840,631 | \$9,253,676,552 |
| 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 |
| 1961..... | 780,784,843 | 32,791,193 | 113,447,996 | 19,774,288 | 946,798,320 |
| To 31 Dec. | | | | | |
| 1961..... | \$11,068,206,402 | \$753,933,973 | \$1,503,221,611 | \$400,120,729 | \$13,725,482,715 |

Metal Production

During the recorded history of the mining industry in Ontario, metals have accounted for 80.64 percent of the accumulated mineral production value.

METAL PRODUCTION TO 31 DECEMBER 1961

| Metal or Product | To 31 December 1960 | 1961 | To 31 December 1961 |
|---|---------------------------|---------------|---------------------------|
| Barium..... | \$ 9,266 | — | \$ 9,266 |
| Bismuth..... | 393,678 | 22,388 | 416,066 |
| Calcium..... | 11,436,712 | 100,881 | 11,537,593 |
| Cerium, rare earths..... | 988 | — | 988 |
| Chromite..... | 55,090 | — | 55,090 |
| Cobalt..... | 94,726,661 | 4,309,912 | 99,036,573 |
| Copper..... | 1,666,952,351 | 122,421,860 | 1,789,374,211 |
| Gold..... | 2,875,317,177 | 93,533,551 | 2,968,850,728 |
| Iron ore..... | 412,010,526 | 62,350,773 | 474,361,299 |
| Lead..... | 7,698,043 | 170,562 | 7,868,605 |
| Magnesium..... | 42,291,551 | 4,307,570 | 46,599,121 |
| Molybdenum..... | 224,110 | — | 224,110 |
| Nickel..... | 3,436,868,706 | 295,423,149 | 3,732,291,855 |
| Pig iron, from domestic ore..... | 98,257,508 | — | 98,257,508 |
| Platinum metals..... | 446,582,265 | 24,534,349 | 471,116,614 |
| Pyrrhotite..... | 3,495,154 | — | 3,495,154 |
| Selenium..... | 10,536,394 | 1,071,200 | 11,607,594 |
| Silver..... | 357,855,799 | 8,361,240 | 366,217,039 |
| Tellurium..... | 358,891 | 39,043 | 397,934 |
| Thorium..... | 105,676 | (1) | 105,676 |
| Tungsten..... | 808,338 | — | 808,338 |
| Uranium (U ₃ O ₈)..... | 783,452,910 | 151,060,610 | 934,513,520 |
| Zinc, in ore and concentrates..... | 37,983,765 | 13,077,755 | 51,061,520 |
| Total..... | \$10,287,421,559 | \$782,557,843 | \$11,069,979,402 |

(1) Not available.

Dividends

In 1961 dividends were paid by 16 gold mining companies, 1 silver-cobalt mining company, 3 base metals mining companies, and 3 uranium mining companies.

DIVIDENDS PAID BY METAL MINING COMPANIES TO 31 DECEMBER 1961

| Industry | To 31 December 1960 | 1961 | To 31 December 1961 |
|---------------------|---------------------------|--------------|---------------------------|
| Gold | \$ 725,634,079 | \$15,837,798 | \$ 741,471,877 |
| Nickel-copper | 1,123,041,492 | 56,430,569 | 1,179,472,061 |
| Silver-cobalt | 107,396,462 | 80,625 | 107,477,087 |
| Uranium | 25,931,425 | 21,494,378 | 47,425,803 |
| Total | \$1,982,003,458 | \$93,843,370 | \$2,075,846,828 |

Metal Prices and Exchange

METAL PRICES AND EXCHANGE, 1960 AND 1961

| 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 | | |
| 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 | 0.9697 ⁽¹⁾ | 2.7228 ⁽¹⁾ | 91.375 | 88.91 | 29.894 | 33.946 |
| 1961 | | | | | | |
| January | 0.9929 | 2.7868 | 91.375 | 91.19 | 26.746 | 34.756 |
| February | 0.9896 | 2.7709 | 91.375 | 90.88 | 27.040 | 34.624 |
| March | 0.9873 | 2.7624 | 91.375 | 91.00 | 27.303 | 34.563 |
| April | 0.9889 | 2.7672 | 91.375 | 91.13 | 27.781 | 34.609 |
| May | 0.9875 | 2.7593 | 91.375 | 91.00 | 29.505 | 34.563 |
| June | 1.0055 | 2.8055 | 91.375 | 92.13 | 28.701 | 35.192 |
| July | 1.0341 | 2.8827 | 91.375 | 95.19 | 27.873 | 36.189 |
| August | 1.0315 | 2.8914 | 91.375 | 95.00 | 28.087 | 36.102 |
| September | 1.0308 | 2.8989 | 91.375 | 94.97 | 28.036 | 36.076 |
| October | 1.0303 | 2.9010 | 91.375 | 94.88 | 27.875 | 36.066 |
| November | 1.0357 | 2.9158 | 92.313 | 95.40 | 28.005 | 36.255 |
| December | 1.0427 | 2.9299 | 103.325 | 108.37 | 28.072 | 36.495 |
| Average | 1.0132 ⁽¹⁾ | 2.8395 ⁽¹⁾ | 92.449 | 94.26 | 27.919 | 35.457 |

⁽¹⁾Computed from daily quotations.

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Prospecting

There was less prospecting activity in 1961 than in 1960. The number of claims recorded was 16,623, compared with 18,474 in 1960. There was an increase in the number of claims recorded in the Eastern Ontario, Kowkash, Porcupine, Saulte Ste. Marie, and Sudbury mining divisions. The greatest number of claims were recorded in the Sudbury mining division, immediately followed by those recorded in the Port Arthur, Patricia, Porcupine, Sault Ste. Marie, Larder Lake, and Montreal River mining divisions. There were 5,459 licences issued and renewed in 1961; 5,755 in 1960.

MINERS' LICENCES AND MINING CLAIMS, 1961

| Mining Division | Miners' Licences | | Mining Claims | |
|------------------------------|------------------|--------------|---------------|---------------|
| | Issued | Renewed | Recorded | Cancelled |
| Eastern Ontario..... | — | — | 806 | 728 |
| Fort Frances..... | 25 | 73 | 199 | 356 |
| Kenora..... | 74 | 115 | 961 | 1,133 |
| Kowkash ⁽¹⁾ | — | — | 1,043 | 1,412 |
| Larder Lake..... | 110 | 226 | 1,421 | 1,450 |
| Montreal River..... | 75 | 84 | 1,211 | 1,494 |
| Parry Sound..... | — | — | 136 | 281 |
| Patricia..... | 89 | 107 | 1,612 | 3,089 |
| Porcupine..... | 124 | 200 | 1,443 | 1,578 |
| Port Arthur..... | 300 | 405 | 2,064 | 3,549 |
| Red Lake..... | 42 | 105 | 1,076 | 1,859 |
| Sault Ste. Marie..... | 157 | 198 | 1,436 | 1,020 |
| Sudbury..... | 214 | 283 | 2,098 | 2,245 |
| Timiskaming..... | 104 | 204 | 1,117 | 1,507 |
| At Toronto..... | 482 | 1,663 | — | — |
| Total..... | 1,796 | 3,663 | 16,623 | 21,701 |

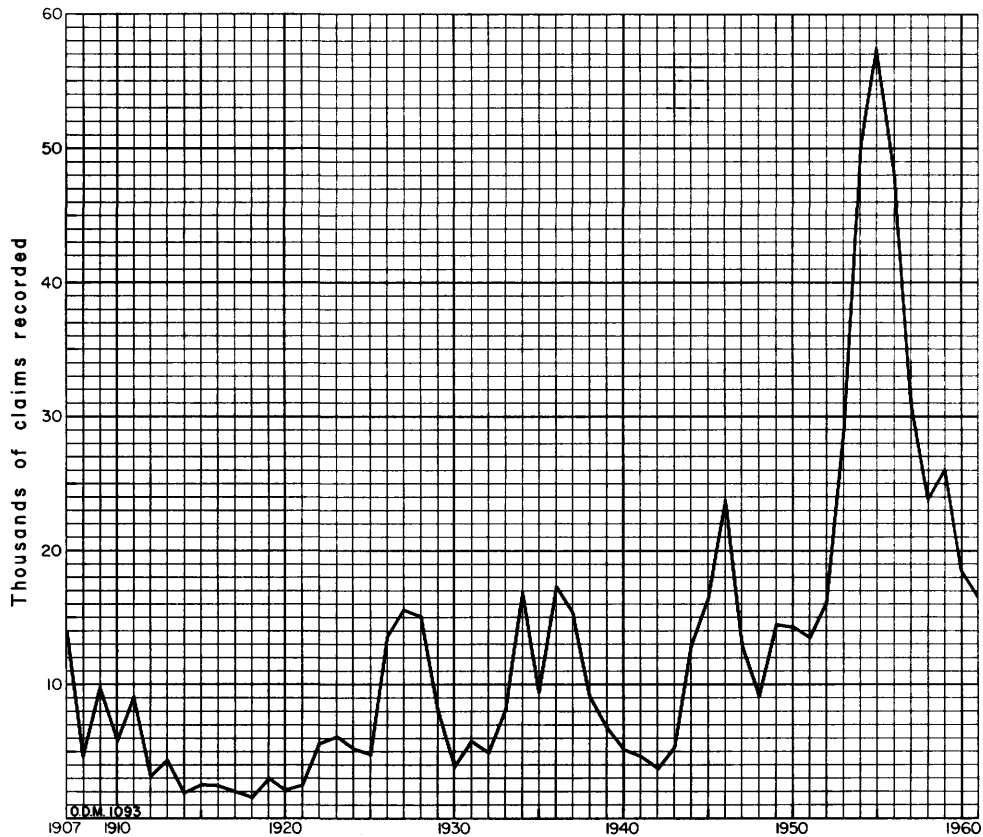
⁽¹⁾Handled by the office of the Patricia Mining Division since 1 April 1956.

MINING CLAIMS RECORDED IN THE ONTARIO MINING DIVISIONS

| Mining Division | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 |
|------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| Eastern Ontario..... | 4,802 | 4,111 | 2,003 | 987 | 993 | 507 | 806 |
| Fort Frances..... | 2,063 | 1,103 | 433 | 801 | 422 | 402 | 199 |
| Kenora..... | 4,504 | 2,731 | 1,247 | 1,090 | 1,146 | 1,162 | 961 |
| Kowkash ⁽¹⁾ | — | — | 3,549 | 896 | 1,368 | 774 | 1,043 |
| Larder Lake..... | 1,091 | 2,112 | 1,630 | 2,276 | 3,540 | 1,430 | 1,421 |
| Montreal River..... | 799 | 2,556 | 1,458 | 1,462 | 1,579 | 1,670 | 1,211 |
| Parry Sound..... | 384 | 423 | 291 | 39 | 182 | 186 | 136 |
| Patricia..... | 955 | 3,150 | 3,074 | 2,002 | 2,628 | 1,912 | 1,612 |
| Porcupine..... | 1,793 | 1,536 | 2,456 | 1,451 | 2,247 | 1,321 | 1,443 |
| Port Arthur..... | 14,552 | 8,532 | 4,351 | 4,027 | 3,479 | 3,095 | 2,064 |
| Red Lake..... | 1,875 | 2,657 | 1,078 | 2,657 | 2,554 | 1,227 | 1,076 |
| Sault Ste. Marie..... | 12,273 | 5,313 | 2,842 | 1,385 | 1,112 | 943 | 1,436 |
| Sudbury..... | 9,984 | 8,768 | 4,959 | 3,063 | 3,481 | 1,921 | 2,098 |
| Timiskaming..... | 2,292 | 5,005 | 1,576 | 1,844 | 1,300 | 1,924 | 1,117 |
| Total..... | 57,367 | 47,997 | 30,947 | 23,980 | 26,031 | 18,474 | 16,623 |

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

MINING CLAIMS RECORDED, 1907-1961



MINING CLAIMS CANCELLED IN THE ONTARIO MINING DIVISIONS

| Mining Division | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 |
|------------------------------|--------|--------|--------|--------|--------|--------|--------|
| Eastern Ontario..... | 3,179 | 5,075 | 4,974 | 3,270 | 1,701 | 1,629 | 728 |
| Fort Frances..... | 665 | 1,651 | 1,177 | 833 | 630 | 619 | 356 |
| Kenora..... | 812 | 3,249 | 3,595 | 2,433 | 1,697 | 1,368 | 1,133 |
| Kowkash ⁽¹⁾ | | | 3,288 | 1,526 | 1,228 | 1,975 | 1,412 |
| Larder Lake..... | 2,238 | 1,450 | 2,004 | 2,201 | 1,604 | 3,667 | 1,450 |
| Montreal River..... | 795 | 792 | 2,196 | 1,911 | 1,858 | 1,985 | 1,494 |
| Parry Sound..... | 570 | 528 | 468 | 640 | 122 | 196 | 281 |
| Patricia..... | 929 | 1,198 | 1,064 | 1,725 | 1,273 | 2,560 | 3,089 |
| Porcupine..... | 757 | 958 | 2,440 | 2,147 | 1,803 | 2,296 | 1,578 |
| Port Arthur..... | 13,905 | 12,355 | 8,352 | 5,791 | 4,255 | 3,833 | 3,549 |
| Red Lake..... | 1,890 | 1,570 | 1,559 | 1,345 | 1,843 | 3,081 | 1,859 |
| Sault Ste. Marie..... | 6,216 | 9,436 | 9,352 | 4,570 | 2,203 | 2,004 | 1,020 |
| Sudbury..... | 8,656 | 6,326 | 9,821 | 8,160 | 4,035 | 4,409 | 2,245 |
| Timiskaming..... | 966 | 1,352 | 4,012 | 2,996 | 2,132 | 1,094 | 1,507 |
| Total..... | 41,578 | 45,940 | 54,332 | 39,548 | 26,395 | 30,717 | 21,701 |

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

Principal Mining Areas of the Province of Ontario



Keys to Symbols

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

STATISTICS AND MINING OPERATIONS

Metallics

BISMUTH

This metal is recovered in the refining of ores and concentrates from the silver-cobalt mines. Production was down 47.34 percent in quantity and 50.68 percent in value from that of 1960.

CALCIUM—see MAGNESIUM AND CALCIUM

COBALT—see NICKEL AND COPPER and SILVER AND COBALT

COPPER—see NICKEL AND COPPER

GOLD

There were 30 gold mines operating in Ontario in 1961. During the year two of these terminated operations owing to the exhaustion of known ore. The 30 mines reported milling 9,021,573 tons of ore, yielding 2,569,509 ounces of gold, valued at \$91,114,790, and 404,693 ounces of silver valued at \$381,463. The average recovery per ton of ore milled was \$10.14. In the operations of the nickel-copper mines there was a recovery of 58,769 ounces of gold, and in the operations of the base metal mines 9,503 ounces were recovered. The total gold production of the province was 2,637,720 ounces with a value of \$93,533,551. This is a decrease of 3.47 percent in quantity and an increase of 0.82 percent in value compared with the production of 1960.

The gold mines paid \$7,105,643 to 1,226 salaried employees and \$38,974,672 to 10,105 wage-earners. They used fuel and electricity worth \$4,637,966, and process supplies worth \$15,742,182.

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

| Year | Porcupine | Kirkland Lake, Larder Lake, and Sudbury | Northwestern Ontario | Total |
|-----------------|---------------|---|-------------------------|---------------|
| 1912-1956 | \$322,113,411 | \$279,425,078 | \$54,147,710 | \$655,686,199 |
| 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 |
| 1961 | 7,540,668 | 4,950,034 | 3,347,096 | 15,837,798 |
| Total | \$366,368,044 | \$304,745,297 | \$70,358,536 | \$741,471,877 |

GOLD PRODUCTION, 1961

| Areas and Mines | Rated Daily Mill Capacity tons | Daily Operating Average tons | Ore Milled tons | Bullion Recovered | | | | Total Value of Bullion Canadian Dollars |
|------------------------|-----------------------------------|---------------------------------|--------------------|--------------------|---------------------|--------------------|------------------|---|
| | | | | Gold Content | | Silver Content | | |
| | | | | Quantity ounces | Value | Quantity ounces | Value | |
| FORCUPINE | | | | | | | | |
| Aunor..... | 750 | 764 | 278,730 | 86,932 | \$ 3,082,609 | 6,279 | \$ 5,918 | \$ 3,088,527 |
| Broulan Reef..... | 700 | 401 | 109,445 | 23,018 | 816,218 | 1,835 | 1,730 | 817,948 |
| Carium..... | 500 | 248 | 67,570 | 22,174 | 786,290 | 4,224 | 3,981 | 790,271 |
| Delnite..... | 520 | 502 | 183,314 | 48,114 | 1,706,122 | 3,606 | 3,399 | 1,709,521 |
| Done..... | 1,975 | 1,985 | 714,700 | 174,283 | 6,180,075 | 38,232 | 36,037 | 6,216,112 |
| Hallnor..... | 400 | 333 | 121,721 | 38,098 | 1,350,955 | 2,709 | 2,553 | 1,353,508 |
| Hollinger..... | 3,900 | 3,927 | 1,056,323 | 284,272 | 10,080,285 | 64,636 | 60,926 | 10,141,211 |
| Hugh-Pam..... | milled at Broulan Reef | 37,077 | 7,132 | 252,901 | | | | 252,901 |
| McIntyre..... | 2,400 | 2,172 | 747,030 | 225,066 | 7,980,840 | 35,948 | 33,885 | 8,014,725 |
| Pamour..... | 1,750 | 1,774 | 647,618 | 59,784 | 2,119,941 | 8,787 | 8,283 | 2,128,224 |
| Paymaster..... | 750 | 532 | 194,293 | 39,382 | 1,396,486 | 8,782 | 8,278 | 1,404,764 |
| Preston..... | 800 | 589 | 214,840 | 45,973 | 1,630,203 | 5,390 | 5,081 | 1,635,284 |
| Ross..... | 450 | 419 | 145,291 | 20,920 | 741,823 | 28,080 | 26,468 | 768,291 |
| Total..... | 14,895 | 13,646 | 4,517,952 | 1,075,148 | \$38,124,748 | 208,508 | \$196,539 | \$38,321,287 |
| KIRKLAND LAKE | | | | | | | | |
| Lake Shore..... | 1,200 | 901 | 169,785 | 57,979 | \$ 2,055,935 | 21,428 | \$ 20,198 | \$ 2,076,133 |
| Macassa..... | 500 | 420 | 153,171 | 68,380 | 2,424,755 | 10,137 | 9,555 | 2,434,310 |
| Sylvanite..... | 600 | 374 | 102,109 | 29,996 | 1,063,658 | 7,364 | 6,941 | 1,070,599 |
| Teck-Hughes..... | 650 | 387 | 141,190 | 26,498 | 939,268 | 4,236 | 3,993 | 943,257 |
| Upper Canada..... | 550 | 563 | 205,404 | 59,422 | 2,107,104 | 32,737 | 30,858 | 2,137,962 |
| Wright-Hargreaves..... | milled at Lake Shore | 159,078 | 58,891 | 2,088,275 | | 15,090 | 14,224 | 2,102,499 |
| Total..... | 3,500 | 2,645 | 930,737 | 301,156 | \$10,678,991 | 90,992 | \$ 85,769 | \$10,764,760 |
| LARDER LAKE | | | | | | | | |
| Kerr-Addison..... | 4,000 | 4,083 | 1,490,319 | 520,868 | \$18,469,979 | 29,309 | \$ 27,627 | \$18,497,606 |
| SUDBURY | | | | | | | | |
| Renabie..... | 550 | 548 | 200,215 | 37,934 | \$ 1,345,140 | 10,971 | \$ 10,341 | \$ 1,355,481 |

| | | | | | | | | | |
|--|---------------|---------------|------------------|------------------|---------------------|----------------|------------------|---------------------|--|
| KENORA (PATRICIA PORTION) | | | | | | | | | |
| Campbell Red Lake..... | 700 | 704 | 257,096 | 157,261 | \$ 5,576,475 | 11,898 | \$ 11,215 | \$ 5,587,690 | |
| Cochenoir Williams..... | 275 | 263 | 96,155 | 79,054 | 2,803,255 | 3,754 | 3,538 | 2,806,794 | |
| Dickenson..... | 470 | 471 | 171,935 | 88,579 | 3,141,011 | 8,968 | 8,453 | 3,149,464 | |
| Madsen Red Lake..... | 800 | 825 | 301,031 | 106,096 | 3,762,164 | 17,126 | 16,143 | 3,778,307 | |
| McKenzie Red Lake..... | 235 | 229 | 83,587 | 21,066 | 747,001 | 6,968 | 6,568 | 753,568 | |
| Pickle Crow..... | 400 | 342 | 124,821 | 48,447 | 1,717,931 | 5,000 | 4,713 | 1,722,644 | |
| H. G. Young..... | 425 | 320 | 116,708 | 22,959 | 814,126 | 2,568 | 2,421 | 816,547 | |
| Total..... | 3,305 | 3,154 | 1,151,333 | 523,462 | \$18,561,963 | 56,282 | \$ 53,051 | \$18,615,014 | |
| THUNDER BAY | | | | | | | | | |
| Leitch..... | 120 | 96 | 34,953 | 38,076 | \$ 1,350,175 | 1,604 | \$ 1,512 | \$ 1,351,687 | |
| MacLeod-Cockshutt..... | 1,900 | 1,907 | 696,064 | 72,005 | 2,553,297 | 6,939 | 6,541 | 2,559,838 | |
| Total..... | 2,020 | 2,003 | 731,017 | 110,081 | \$ 3,903,472 | 8,543 | \$ 8,053 | \$ 3,911,525 | |
| SUNDRIES | | | | | | | | | |
| Clean-up, abandoned operations etc..... | — | — | — | 860 | \$ 30,497 | 88 | \$ 83 | \$ 30,580 | |
| Total for Gold Mines..... | 28,270 | 26,079 | 9,021,573 | 2,569,509 | \$91,114,790 | 404,693 | \$381,463 | \$91,496,253 | |
| Nickel-copper refining..... | — | — | — | 58,769 | \$ 2,083,948 | — | — | — | |
| Base metal mines..... | — | — | — | 9,442 | 334,813 | — | — | — | |
| Total Gold Production, 1961... | — | — | — | 2,687,720 | \$95,306,551 | — | — | — | |

GOLD PRODUCTION, 1960

| | | | | | | | |
|---|------------------|----------|------------------|---------------------|----------------|------------------|---------------------|
| Porcupine..... | 4,632,437 | — | 1,084,413 | \$36,815,821 | 243,019 | \$216,068 | \$37,031,889 |
| Kirkland Lake..... | 1,070,180 | — | 332,794 | 11,298,356 | 94,947 | 84,417 | 11,382,773 |
| Larder Lake..... | 1,667,638 | — | 592,244 | 20,106,684 | 33,371 | 29,670 | 20,136,354 |
| Sudbury..... | 179,520 | — | 38,911 | 1,321,028 | 11,061 | 9,834 | 1,330,862 |
| Kenora (Patricia Portion) | 1,064,863 | — | 511,311 | 17,359,008 | 51,994 | 46,227 | 17,405,235 |
| Thunder Bay..... | 722,118 | — | 106,310 | 3,609,225 | 8,159 | 7,254 | 3,616,479 |
| Sundries..... | — | — | 550 | 18,673 | 78 | 71 | 18,744 |
| Total for Gold Mines, 1960... | 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 | — | — | — |

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Aunor Gold Mines Limited

Aunor Gold Mines Limited was incorporated in May 1939, with an authorized capitalization of 2,000,000 shares of \$1 par value, all of which have been issued. The directors and officers were: J. R. Bradfield, president and director; W. S. Row, vice-president and director; 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 1961.

SHAFTS, AUNOR MINE

| | Claim No. | Inclination | Number of Compartments | Depth Below Surface |
|--|-----------|-------------|------------------------|---------------------|
| No. 1 | H.S.850 | Vertical | 3 | 3,082 |
| No. 2 (service winze between 2,125- and 2,900-foot levels) | T.R.S.828 | 62° | 2 | 2,907 |

Development work consisted of the following: drifting, 3,806 feet; cross-cutting, 115 feet; raising, 215 feet. The total corrected development footage to 31 December 1961 was as follows: drifts, 69,837 feet; crosscuts, 13,351 feet; raises, 32,944 feet. Diamond-drilling in 1961 consisted of 411 holes, totalling 30,758 feet, from underground.

New construction included a trestle with a tailings line to the Ankerite dam, and a pump-and-blower house for the mill. New equipment added included five slusher hoists, and two pumps (Worthington) with motors for the Ankerite dam.

The following is taken from the manager's report for the year ending 31 December 1961:

Mining

Mining was again carried on between the 1,500-foot and 2,900-foot levels. About 12 percent of the ore mined came from above the 2,125-foot horizon.

Total ore mined during the year amounted to 277,000 tons with an average grade of 0.33 ounces gold per ton; this compares with 265,260 tons of the same grade, in 1960.

Development

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

On the 3,250-foot level the exploration drift has been advanced a further 205 feet; thus the ore zone has been explored to a point 1,260 feet east of the Aunor-Delnite boundary. Diamond-drilling on this horizon continues to indicate that ore conditions should be similar to those on the 3,500-foot level horizon. No further work has been done on the 3,500-foot level.

A drift on the 3,875-foot level has been extended 1,140 feet east of the Aunor-Delnite boundary. Preliminary diamond-drilling and sampling has been insufficient to definitely assess the ore potential of this level.

The drift on the 4,975-foot level has explored the ore zone for 835 feet. Some diamond-drill intersections of ore value have been returned, but no continuity is apparent as yet.

All the exploration work below the 2,900-foot horizon has been done by agreement with Delnite Mines Limited.

Ore Reserves

At the year's end the proven ore reserves were 1,178,000 tons averaging 0.342 ounces of gold per ton.

As compared with 277,000 tons mined, some 335,000 tons of new ore was proved, all in the block between the 2,125-foot and the 2,900-foot levels.

Mill

| | 1961 | 1960 | Total to Date |
|---|-----------|-----------|---------------|
| Milled tons | 278,730 | 264,867 | 4,033,318 |
| Milled per calendar day tons | 763.6 | 723.7 | 502.9 |
| Average gold content oz. per ton | 0.326 | 0.332 | 0.355 |
| Average tailings loss oz. per ton | 0.016 | 0.016 | 0.011 |
| Total recovery percent | 95.25 | 95.26 | 96.84 |
| Total gold production oz. | 86,932 | 83,697 | 1,384,959 |
| Value of total production \$ | 3,088,871 | 2,849,796 | 49,572,258 |
| Recovery per ton \$ | 11.08 | 10.76 | 12.29 |

The alternative tailings disposal area was put into use early in September.

The average number of employees was 409: 291 underground, and 118 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; H. F. Brownbill and F. G. Lawson, vice-presidents and directors; L. B. Harder, J. B. Streit, F. H. Snyder, and N. M. Davis, directors; R. F. Dewar, manager of mining operations; 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, consisting of eighty-one claims, in Whitney, Murphy, and Tisdale townships, Porcupine area, District of Cochrane. It also operates the property of Hugh-Pam Porcupine Mines Limited in the same group, and which is further reported on in this report under that name (*see* page 36). 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 1961. All operations were conducted through the Reef No. 1 shaft, in the north-east quarter of the south half of lot 10, concession V, Whitney township (claim P.13091). The vertical, three-compartment shaft is 2,556 feet deep.

Development work in 1961 consisted of drifting, 515 feet; crosscutting, 29 feet; raising, 572 feet. Total development footage to 31 December 1961 was as follows: drifts, 35,741 feet; crosscuts, 11,759 feet; raises, 15,338 feet. Diamond-drilling during the year consisted of 31 holes, totalling 11,067 feet, from underground.

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The following is taken from the mine manager's report for the year ending 31 December 1961:

Ore Reserves

Proven ore reserves at the Broulan Reef mine are calculated to be 88,000 tons, having an average uncut grade of 0.37 ounces of gold per ton, or a grade cut to one ounce of 0.21 ounces per ton. Hugh-Pam's ore reserves are calculated at 46,000 tons having an average uncut grade of 0.29 ounces of gold per ton, or a grade cut to one ounce of 0.20 ounces per ton.

Milling

During the year, the mill treated a total of 146,520 tons of ore from Broulan Reef and Hugh-Pam mines for a daily average of 401 tons, from which was recovered 30,150.294 ounces of fine gold and 1,835.35 ounces of silver. Recovery averaged 97.9 percent.

General

Some 3,144 tons of waste rock was broken and hoisted from exploration and development work. Some 56,373 cubic yards of sand-fill was delivered underground. Operating costs for the 109,443 tons of ore mined and milled during the year from the Broulan Reef mine, including head office administration and general expense, amounted to \$7.96 per ton.

The average number of employees was 147: 78 underground, and 69 on surface. H. V. Pyke was mine manager.

Campbell Red Lake Mines Limited

Campbell Red Lake Mines Limited was incorporated in August 1944, with an authorized capitalization of 4,000,000 shares of \$1 par value, of which 3,999,500 shares have been issued. The company is controlled by Dome Mines Limited. The directors and officers were: C. W. Michel, chairman of the board; J. B. Redpath, president and director; C. C. Calvin, vice-president, secretary, and director; W. F. James and J. K. McCausland, directors; E. J. Andrecheck, treasurer. The head office is at 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 1961.

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

Development work in 1961 was as follows: drifting, 10,421 feet; crosscutting, 762 feet; raising, 3,557 feet. Total development to 31 December 1961 was as follows: drifts, 119,522 feet; crosscuts, 21,078 feet; raises 32,202 feet. Diamond-drilling in 1961 included one hole, totalling 147 feet, from surface and 252 holes, totalling 48,915 feet, from underground.

New construction in 1961 consisted of the addition of a mill substation to the mill building (18 x 16 ft, steel frame, Trafford corrugated asbestos tile covering) and a concrete-pipe tunnel between the power-house building and the camp buildings (about 500 ft. long, 4 ft. wide, and 7 ft. high). New equipment added included a centrifugal pump, with electrical equipment, on the 21st level underground (Mather and Platt, 1- to 9-stage Plurovane, 320 gpm.); a loader underground (Atlas Copco Co. Ltd., L.M.56, bucket capacity 7 cu. ft.); two locomotives complete with batteries (Atlas Type O, 3½-ton size).

The following is taken from the general manager's report for the year ending 31 December 1961:

Mining

Broken ore totalling 248,000 tons remains in the stopes, a decrease of 12,500 tons from the previous year.

In all, 218,007 tons of a grade of 13.77 pennyweight were drawn from the stopes and sent to the mill.

With the exception of two stopes started on the 10th level, all stoping operations were above the 9th level (or 1,300-foot horizon).

Towards the latter part of the year, classified tailings were sent underground to be used as backfill in stopes. It is expected that the use of hydraulic backfill from ground support and for more efficient mining will gradually expand in future years.

Ore Production

The mine produced 257,096 tons of ore during the year, averaging 13.28 pennyweight. The stopes produced 218,007 tons averaging 13.77 pennyweight, and development work produced 39,089 tons averaging 10.53 pennyweight.

Ore Reserves

The ore reserves are estimated at 1,129,700 tons, an increase of 1,600 tons over last year. The ore reserves include 248,000 tons of broken ore, a decrease of 12,500 tons from last year.

A summary of the distribution of ore in place, broken ore, and total ore extracted from stopes to the end of 1961 is as follows:

SUMMARY OF ORE RESERVES AND EXTRACTION BY LEVELS

| Level | Ore in Place | Average Grade | Broken Ore | Total Ore extracted from stopes to end of 1961 |
|-----------------------|--------------|---------------|------------|--|
| | tons | dwt. per ton | tons | tons |
| Surface to 1st..... | 9,300 | 11.76 | | 243,390 |
| 1st to 2nd..... | 20,400 | 11.91 | 400 | 284,554 |
| 2nd to 3rd..... | 32,000 | 10.76 | | 258,716 |
| 3rd to 4th..... | 41,400 | 9.02 | 6,600 | 340,956 |
| 4th to 5th..... | 44,000 | 11.53 | 60,000 | 295,573 |
| 5th to 6th..... | 73,200 | 15.44 | 75,300 | 237,402 |
| 6th to 7th..... | 94,500 | 12.36 | 37,100 | 223,431 |
| 7th to 8th..... | 62,200 | 12.56 | 30,200 | 161,570 |
| 8th to 9th..... | 57,200 | 11.49 | 22,600 | 123,518 |
| 9th to 10th..... | 88,300 | 13.36 | 6,100 | 9,652 |
| 10th to 11th..... | 69,600 | 12.52 | | |
| 11th to 12th..... | 60,700 | 11.72 | 8,900 | 5,863 |
| 12th to 13th..... | 100,100 | 14.84 | 300 | 1,098 |
| 13th to 14th..... | 128,800 | 15.32 | 500 | 1,069 |
| Total and Average.... | 881,700 | 13.08 | 248,000 | 2,186,792 |

Mill

The following are the results of milling operations:

| | | |
|-----------------------------------|---------|---------|
| Ore treated..... | tons | 257,096 |
| Average per calendar day..... | tons | 704 |
| Average grade of ore treated..... | dwt. | 13.28 |
| Recovery..... | dwt. | 12.34 |
| Recovery..... | percent | 92.96 |

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Costs

The expenditure on mining was \$810,258, or \$3.15 per ton milled.

The expenditure on development (including work done by H. G. Young Mines Limited) was \$648,160, or \$2.52 per ton milled.

Operating costs (including the above-mentioned item) were \$9.23 per ton milled.

General

During the third quarter of the year, ore sent to the mill proved to be more refractory than normal, resulting in a slightly lower recovery for the year.

Exploration at depth of parts of the property remote from known ore zones, underground work on the northern claims carried out through the H. G. Young shaft, and work in the establishment of the seven new levels, adversely affected costs. Other factors that increased costs were higher wages and increased power rates.

The average number of employees was 279: 140 underground, and 139 on surface. Joseph Chisholm was general manager.

Carium Mines Limited

Carium Mines Limited was incorporated in December 1960, with an authorized capitalization of 1,000,000 shares of no par value, of which 553,352 shares have been issued. The directors and officers were: H. S. McGowan, president and director; J. T. McWhirter, treasurer and director; G. T. N. Woodroffe, director; D. D. Anderson, secretary. The head office is at 25 King Street West, Toronto. The mine address is Schumacher.

The main property consists of nineteen 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. The property name was changed from Coniaurum Mines Limited to Carium Mines Limited, effective 1 March 1961. The mine operated on a salvage basis until 1 August 1961, when underground ore production ceased. The mill operated until 9 August, and the shaft was capped on 29 September 1961. All underground equipment was removed, and the surface plant has been sold.

SHAFTS, CARIUM MINE

| | Location | Number of Compartments | Depth below Surface |
|--|--|------------------------|---------------------|
| Bishop shaft..... | N. $\frac{1}{2}$, lot 7, con. III, Tisdale twp. | 3 to 2,000 ft. | feet |
| Bishop subshaft (below 3,250-foot level) | | 4 below 2,000 ft. | 3,666 |
| Goldale shaft..... | S.E. $\frac{1}{4}$ of N. $\frac{1}{2}$, lot 8, con. III, Tisdale twp. | 4 | 5,641 |
| No. 1 winze (below 2,000-foot level).... | | 2 to 400 ft. | 1,020 |
| No. 2 winze (below 3,000-foot level).... | — | 3 below 400 ft. | 2,533 |
| No. 3 winze (below 2,000-foot level).... | — | 2 | 5,028 |
| | — | 2 to 3,500 ft. | 2,755 |
| | — | 3 below 3,500 ft. | |
| | — | 2 | |

The following table gives the development footages completed by Coniaurum Mines Limited and Carium Mines Limited in 1961, and shows the accumulated totals at the cessation of underground operations, 1 August 1961:

UNDERGROUND DEVELOPMENT, CONIAURUM AND CARIUM MINES

| Sublevel of Level | Drifts | | Crosscuts | | Raises (excluding box-holes) | |
|----------------------|--------|-------|-----------|-------|---------------------------------|-------|
| | 1961 | Total | 1961 | Total | 1961 | Total |
| | feet | feet | feet | feet | feet | feet |
| 100-ft..... | — | 90 | — | 71 | — | 19 |
| 150-ft..... | — | 732 | — | 414 | — | — |
| 200-ft..... | — | 171 | — | — | — | 490 |
| 250-ft..... | — | 484 | — | — | — | 167 |
| 400-ft. level..... | — | 3,831 | — | 7,168 | — | 907 |
| 500-ft. level..... | — | 548 | — | 94 | — | 207 |
| 600-ft..... | — | 55 | — | — | — | 323 |
| 650-ft..... | — | — | — | 78 | — | — |
| 700-ft. level..... | — | 3,710 | — | 3,390 | — | 1,988 |
| 770-ft..... | — | — | — | 5 | — | — |
| 800-ft..... | — | 304 | — | — | — | 485 |
| 850-ft..... | — | 1,189 | — | 497 | — | 209 |
| 900-ft..... | — | 1,430 | — | 174 | — | 1,230 |
| 950-ft..... | — | 562 | — | — | — | 202 |
| 975-ft..... | — | 194 | — | — | — | 4 |
| 1,000-ft. level..... | — | 7,884 | — | 9,323 | 64 | 7,513 |
| 1,100-ft..... | — | 141 | — | 43 | — | 61 |
| 1,125-ft..... | — | 529 | — | 229 | — | — |
| 1,150-ft..... | — | 22 | — | — | — | — |
| 1,225-ft..... | — | 22 | — | — | — | 9 |
| 1,250-ft. level..... | — | 4,274 | — | 5,533 | — | 3,580 |
| 1,300-ft..... | — | 367 | — | 164 | — | 181 |
| 1,350-ft..... | — | 245 | — | — | — | 148 |
| 1,375-ft..... | — | 386 | — | 51 | — | 236 |
| 1,400-ft..... | — | 499 | — | 62 | — | 669 |
| 1,425-ft..... | — | — | — | — | — | 221 |
| 1,450-ft..... | — | 146 | — | — | — | 115 |
| 1,475-ft..... | — | 455 | — | — | — | 58 |
| 1,500-ft. level..... | — | 6,171 | — | 8,255 | — | 4,292 |
| 1,600-ft..... | — | 131 | — | — | — | — |
| 1,625-ft..... | — | 469 | — | — | — | 8 |
| 1,650-ft..... | — | 70 | — | — | — | 5 |
| 1,675-ft..... | — | 52 | — | — | — | — |
| 1,700-ft..... | 37 | 250 | — | — | — | 430 |
| 1,725-ft..... | — | 189 | — | — | — | 50 |
| 1,750-ft. level..... | 13 | 4,070 | — | 4,113 | 22 | 3,408 |
| 1,900-ft..... | — | 558 | — | — | — | 358 |
| 1,950-ft..... | 34 | 159 | — | — | 20 | 70 |
| 1,975-ft..... | — | 68 | — | — | — | 19 |
| 2,000-ft. level..... | — | 5,754 | — | 6,879 | 6 | 5,023 |
| 2,100-ft..... | — | 1,096 | — | 418 | — | 500 |
| 2,125-ft..... | — | 340 | — | — | — | — |
| 2,200-ft..... | 38 | 459 | — | — | 24 | 120 |
| 2,250-ft..... | — | 1,198 | — | 335 | — | 539 |
| 2,300-ft. level..... | 47 | 1,868 | — | 2,476 | — | 2,505 |
| 2,350-ft..... | — | 77 | — | — | — | 29 |
| 2,450-ft. level..... | — | 1,024 | — | 761 | — | 2,718 |
| 2,500-ft..... | — | 1,278 | — | 689 | — | 173 |
| 2,525-ft..... | — | 335 | — | 86 | — | 259 |
| 2,600-ft. level..... | — | 1,164 | — | 693 | — | 2,012 |
| 2,750-ft. level..... | — | 2,604 | — | 2,956 | — | 3,647 |
| 2,800-ft..... | — | 140 | — | — | — | 20 |

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UNDERGROUND DEVELOPMENT, CONIAURUM AND CARIUM MINES—Continued

| Sublevel of Level | Drifts | | Crosscuts | | Raises (excluding box-holes) | |
|----------------------------|--------|---------|-----------|---------|---------------------------------|---------|
| | 1961 | Total | 1961 | Total | 1961 | Total |
| | feet | feet | feet | feet | feet | feet |
| 2,825-ft..... | — | 147 | — | — | — | 18 |
| 2,875-ft..... | — | 101 | — | 224 | — | 510 |
| 2,900-ft..... | — | 163 | — | — | — | 242 |
| 2,950-ft..... | — | 82 | — | — | — | 169 |
| 3,000-ft. level..... | — | 3,346 | — | 6,693 | — | 6,553 |
| 3,025-ft..... | — | 5 | — | — | — | — |
| 3,100-ft..... | — | 261 | — | 160 | — | 268 |
| 3,150-ft..... | 46 | 308 | — | — | 7 | 277 |
| 3,175-ft..... | — | 145 | — | — | — | 227 |
| 3,200-ft..... | — | 117 | — | — | — | — |
| 3,225-ft..... | — | 157 | — | — | — | 105 |
| 3,250-ft. level..... | — | 4,451 | — | 3,565 | — | 5,051 |
| 3,300-ft..... | — | 247 | — | — | — | — |
| 3,325-ft..... | — | 5 | — | — | — | — |
| 3,350-ft..... | — | 236 | — | — | — | 98 |
| 3,375-ft..... | — | 338 | — | 110 | — | 188 |
| 3,400-ft..... | — | 307 | — | 93 | — | 130 |
| 3,425-ft..... | — | 270 | — | 101 | — | 88 |
| 3,450-ft..... | — | 102 | — | — | — | 69 |
| 3,500-ft. level..... | — | 4,860 | — | 11,926 | 12 | 7,702 |
| 3,525-ft..... | — | 128 | — | — | — | 15 |
| 3,550-ft..... | — | 169 | — | 127 | — | 291 |
| 3,600-ft..... | — | 158 | — | 87 | — | 193 |
| 3,650-ft..... | — | 23 | — | — | — | 8 |
| 3,700-ft..... | — | 186 | — | — | — | 76 |
| 3,725-ft..... | — | 25 | — | — | — | — |
| 3,750-ft. level..... | — | 7,320 | — | 4,185 | 28 | 9,150 |
| 3,800-ft..... | — | 188 | — | — | — | 112 |
| 3,900-ft..... | — | 1,389 | — | 255 | — | 871 |
| 3,925-ft..... | — | 735 | — | 194 | — | 489 |
| 4,000-ft. level..... | 10 | 6,410 | — | 2,696 | 29 | 6,734 |
| 4,050-ft..... | — | 117 | — | — | — | 49 |
| 4,075-ft..... | — | 178 | — | — | — | 136 |
| 4,100-ft..... | — | 1,243 | — | — | — | 970 |
| 4,150-ft..... | — | 1,560 | — | 303 | — | 1,739 |
| 4,200-ft..... | — | 17 | — | — | — | — |
| 4,250-ft. level..... | — | 3,651 | — | 2,983 | — | 5,834 |
| 4,325-ft..... | — | 124 | — | — | — | 24 |
| 4,375-ft..... | — | 185 | — | — | — | 296 |
| 4,400-ft..... | — | 970 | — | — | — | 455 |
| 4,425-ft..... | — | 117 | — | — | — | 38 |
| 4,500-ft. level..... | — | 2,524 | — | 5,539 | — | 4,957 |
| 4,550-ft..... | — | 103 | — | — | — | — |
| 4,675-ft..... | — | 198 | — | — | — | 76 |
| 4,750-ft. level..... | — | 3,078 | — | 3,920 | — | 3,114 |
| 4,925-ft..... | — | 163 | — | — | — | 18 |
| 4,950-ft..... | — | 262 | — | — | — | 421 |
| 5,000-ft. level..... | — | 3,874 | — | 11,783 | — | 4,705 |
| 5,025-ft..... | — | 186 | — | — | — | 17 |
| 5,075-ft..... | — | 76 | — | — | — | 11 |
| 5,100-ft..... | — | 192 | — | — | — | 3 |
| 5,200-ft..... | — | 77 | — | — | — | — |
| 5,250-ft. level..... | — | 4,031 | — | 5,137 | — | 4,507 |
| 5,300-ft..... | — | 50 | — | — | — | — |
| 5,325-ft..... | — | 291 | — | 45 | — | 182 |
| 5,400-ft..... | — | 515 | — | — | — | 363 |
| 5,500-ft. level..... | — | 2,329 | — | 10,810 | — | 4,859 |
| 5,500-ft. (loading pocket) | — | — | — | — | — | 349 |
| Total..... | 225 | 116,284 | — | 125,893 | 212 | 117,964 |

During the period of mill operation, from 1 January to 9 August, 1961, a total of 67,570 tons of ore was hoisted and milled; 20,550 tons by Coniaurum and 47,020 tons by Carium.

The average number of employees was 99: 60 underground, and 39 on surface. W. O. Lafontaine was 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 forty-nine claims in Dome township, Red Lake area, District of Kenora (Patricia Portion).

Mining and milling continued throughout 1961.

SHAFTS, COCHENOUR WILLANS MINE

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

Development work in 1961 consisted of the following: drifting, 4,830 feet; crosscutting, 8,127 feet; raising, 3,430 feet. Development footage to 31 December 1961 was as follows: drifts, 85,755 feet; crosscuts, 65,340 feet; raises, 52,643 feet. Diamond-drilling in 1961 consisted of 632 holes, totalling 91,978 feet, from underground and 42 holes totalling 18,544 feet, from underground, for Wilmar Mines Limited.

Equipment added in 1961 included an elevated water tank (146 ft. high, capacity 100,000 U.S. gals); four drills (Canadian Ingersoll-Rand, JR 300A); two trucks (International, 1/2-ton); and a geophysical instrument (Ronka).

The following is taken from the manager's report for the year ending 31 December 1961:

The moderate but progressive program to expand the mining operation established over the past five years was maintained during the year under review, and the tonnage milled was increased by 6,105 tons. A new record in production was attained with revenue from gold and silver sales amounting to \$2,824,597 for the year. Although no benefit was received under the Emergency Gold Mining Assistance Act, the company's operating profit rose to \$1,178,377, a new high. An average price of \$35.685 per ounce was received for all gold produced.

The more refractory and talcose ores mentioned in last year's report presented many problems in milling during 1961, and recovery dropped from the high of 95.03 percent attained in 1960 to 93.87 percent in 1961.

Production and Costs

During the year, 171,448 tons was hoisted of which 96,155 tons was ore and 75,293 tons was waste (this includes the waste from the Marcus and Wilmar drives). Mining produced 88,237 tons of the ore milled, and the balance of 7,918 tons came from development.

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The 96,155 tons of ore milled yielded a recovery of 79,053.951 ounces of fine gold and 3,753,720 ounces of silver. The total value of this bullion was \$2,824,597 for an average recovery of \$29.375 per ton milled.

Daily tonnage milled was increased during 1961 by 18.1 tons per day to 264 tons. The average price received for gold was higher than the previous year by \$1.255 per ounce. The average grade of ore supplied to the mill was higher than the previous year by 0.0132 ounce per ton, but the average recovered grade increased only 0.0024 ounce per ton owing to a more refractory ore adversely affecting extraction.

COST PER TON PRODUCED

| | Total | 1961 | 1960 | 1959 | 1958 | 1957 |
|-----------------------------------|--------------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Development | \$ 467,615 | \$ 4.863 | \$ 4.836 | \$ 4.965 | \$ 4.158 | \$ 4.876 |
| Mining | 588,454 | 6.120 | 5.955 | 5.967 | 6.206 | 5.876 |
| Milling | 323,783 | 3.367 | 3.136 | 2.990 | 2.832 | 2.688 |
| General and administrative .. | 248,499 | 2.584 | 2.585 | 2.755 | 2.744 | 2.584 |
| Marketing | 17,869 | 0.186 | 0.194 | 0.177 | 0.234 | 0.235 |
| Total Operating Costs | \$1,646,220 | \$17.120 | \$16.706 | \$16.854 | \$16.174 | \$16.259 |
| Milled | tons | 96,155 | 90,010 | 84,004 | 77,804 | 75,550 |

Mining

The milled feed was supplied from the mining of 79 stopes, which produced 88,218 tons of ore averaging 0.888 ounce gold per ton, and 53 development places, which produced 7,937 tons averaging 0.736 ounce per ton.

There has been no change in the occurrence of the ore deposits, which continue to be severely faulted to such an extent that any attempt to estimate ore reserves with any accuracy is not possible. The indicated ore situation, however, continues to be favourable on the new horizons.

Milling and Metallurgy

Talc, referred to in last year's report, is now constantly present in the ore sent to the mill and has become an accepted fact. The mill circuit has been adjusted to its accommodation. The necessary depression of this material in flotation, however, is to some degree responsible for a lower extraction. The coarse portion of the flotation pulp, 48 percent of the tons milled, is re-ground and cyanided in conjunction with the roasted product.

The ore has become more refractory, and the sulphides more complex. Antimony present in the roasting concentrate retards extraction in cyanidation. The metallurgical problems are having continued attention.

A James concentrating table was purchased and placed in operation during the latter part of the year. The purpose of this machine is to upgrade and reduce the quantity of low-grade concentrate produced by the jigs.

A wet cyclone has been purchased, and its operation will be tested against the present classifier.

Much of the mill equipment has been reconditioned, and other equipment added, including a new pump and replacement of process piping. A second mobile concentrate table has been installed, and a three-stage cyclone circuit for desliming tails has been placed in operation.

Exploration

WILMAR EXPLORATION

Three host rocks that carry significant gold values were located in the Wilmar property within the last 400 feet of the south crosscut. Recommended crosscutting east and west to establish diamond-drill bases for further exploration, and extension of these structures, has now been completed from the south end of the Wilmar crosscut, one a distance of 700 feet to the southwest and the other 1,000 feet to the east.

Subsequent diamond-drilling in the southwest area from the west drift has confirmed and expanded good values in the carbonatized zones occurring within a granular volcanic. The best intersections occur intermittently about 400 feet north of the southwest drive over a length of 600 feet. Study of these results suggest the area has been subjected to north-south faulting very similar to that on the Cochenour Willans property. Further drilling will be carried out in this area, to be followed by an exploration drift, which will investigate and assess the blocks of ore indicated.

The dioritic sill or dike structure referred to last year has been extended by drilling over a length of 975 feet and is still open at both ends. The position of this dike is immediately north of the east and west crosscuts and tops roughly 300 feet below the 1,300-foot horizon. It has been traced for a vertical depth of 675 feet. Diamond-drilling will continue to explore and define this dike along strike and down dip.

In the course of driving the east drift, a zone of irregularly fractured massive lava, carrying visible gold, was crossed about 800 feet east of the south crosscut. This section is in a strongly faulted area and, although many good intersections have been returned, the results so far are inconclusive but warrant further investigation.

In all, the results to date on the Wilmar exploration program have been very encouraging and warrant an accelerated program of diamond-drilling during 1962. Some development is also being considered necessary along the better structures indicated by drilling, to study and assess mining grade and structural geology. The dictates of information that will be gained from the above diamond-drilling and development will define the exact form and direction of subsequent work.

Electric power has been extended to the ends of the east-west drives to accommodate the use of electrically-driven diamond-drills for long-hole drilling. The first drill is expected to arrive at the property about 1 April 1961.

CONSOLIDATED MARCUS EXPLORATION

The drive across the Cochenour property to the east, and into the Marcus ground, was extended a total of 3,400 feet during the year. At the year's end this drive was 1,148 feet into the Marcus property. In the course of the advance some poor ground was crossed that slowed down the advance temporarily and necessitated heavy timbering for 250 feet. The drift re-entered good competent rock at the Cochenour-Marcus boundary.

It is recommended that the Marcus drive continue on line without abatement during 1962. Some values of interest have been returned in the drift muck from time to time, however, no investigation of these has been undertaken. This drive is now over 6,000 feet from the Cochenour shaft. The mechanical train, electric trammer, and equipment have continued to give efficient service. The ventilation system continues to provide good working conditions. When the drive has advanced another 2,000 feet, a compressed-air booster unit will be installed to increase the air pressure for drilling machines for the balance of the drive.

This drift is being electrified as it is advanced, and power will be available for electric diamond-drills when the drilling program is undertaken.

The average number of employees was 201: 97 underground, and 104 on surface. J. E. J. Fahlgren, vice-president was manager at the property.

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; 3,258,410 shares have been issued. The directors and officers were: J. G. Boeckh, president and director; P. K. Hanley, vice-president and director; A. K. Harvie, R. C. Stanley Jr., S. J. Bird, J. C. L. Allen, and J. C. Adamson, directors; Miss B. A. Argo, secretary. The head office is at 199 Bay Street, Toronto 1. The mine address is Geraldton.

The main property consists of twenty 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 seventeen claims, in Errington township.

Operations at the main property continued throughout 1961. The mine has been developed through a vertical, three-compartment shaft, 2,530 feet deep, known as the No. 1 or Mosher, in claim T.B.10046. In 1957 a second four-compartment shaft, No. 2, was collared to a depth of 52 feet in claim T.B.10065, about 3,000 feet west of No. 1 shaft.

Development work in 1961 consisted of 2,052 feet of drifting, 842 feet of crosscutting, and 2,613 feet of raising. Total development footage to 31 December 1961 was as follows: 13,937 feet of drifts; 7,326 feet of crosscuts; 5,452 feet of raises. Diamond-drilling in 1961 consisted of 155 holes, totalling 17,337 feet, from underground.

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New construction consisted of an oil house (10- x 6-ft, concrete-block construction). New equipment added included a spare mine cage (5 ft. 3 in. by 5 ft. 6 in.), and 5,500 feet of cable (A.W.G.-3C-3/o) from the power centre to the underground workings.

The following is taken from the general manager's report for the year ending 31 December 1961:

All underground work in 1961 had been directed toward stope preparation of the block of ore above the 2,040-foot level. This block of developed ore contains 2,558,000 tons, averaging 0.133 ounces of gold per ton, and has been laid out to include 638,000 tons in pillars and 1,920,000 tons in stopes. Production from these stopes in 1962 is scheduled to average 1,250 tons per day.

Development of the next block of ore immediately below the 2,040-foot level will require a new underground shaft to be sunk from that level. This will be located 3,000 feet west of No. 1 shaft, and a development heading is now being driven towards the proposed site.

Closely spaced diamond-drilling from the new levels will be necessary to provide information for an estimate of additional ore reserves.

H. E. Rudd was general manager; 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 have been issued. The directors and officers were: W. V. Moot, president and managing director; Whitworth Ferguson and K. C. Gray, vice-presidents and directors; W. S. Walton, secretary treasurer and director; W. L. Marcy, F. R. Burton, and A. F. Osborn, directors. The address of both the head office and mine office is Box 590, Timmins.

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

Mining and milling continued throughout 1961.

SHAFTS, DELNITE MINE

| | Claim No. | Inclination | Number of Compartments | Depth from Surface |
|--|-----------|-------------|------------------------|--------------------|
| No. 1 shaft (inactive)..... | T.R.S.825 | Vertical | 2 | feet 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 |

Development work in 1961 consisted of 1,019 feet of drifting; 1,115 feet of crosscutting; and 1,555 feet of raising. Total development footage to 31 December 1961 was as follows: 90,238 feet of drifts; 45,681 feet of crosscuts; and 54,798 feet of raises. Diamond-drilling in 1961 consisted of 121 holes, totalling 17,414 feet, from underground.

The following was additional equipment in 1961:

- 1 skip bail (3-ton).
- 5 slusher hoists.
- 1 tractor (TD 14A).
- 2 mucking machines.
- 3 electric motors (15 hp.).
- 1 truck (3½-ton).

The following is taken from the mine manager's report for the year ending 31 December 1961:

Broken-ore Reserves

Broken-ore reserves are estimated at 12,891 tons.

COSTS

| | Total Cost | Costs per Ton Milled | | Cost per Ounce Fine Gold Produced 1961 |
|---|--------------------|----------------------|---------------|--|
| | | 1961 | 1960 | |
| OPERATING COSTS (before cost-aid) | | | | |
| Development and exploration | \$ 79,009 | \$ 0.43 | \$0.61 | \$ 1.65 |
| Mining | 1,185,179 | 6.47 | 5.85 | 24.81 |
| Milling | 302,726 | 1.65 | 1.70 | 6.34 |
| General mine charges after deducting sundry revenue | 162,497 | 0.89 | 0.79 | 3.40 |
| Administrative expense (partly mine) | 52,473 | 0.29 | 0.28 | 1.10 |
| Bullion marketing expense, including mint handling and refining charges | 12,142 | 0.06 | 0.06 | 0.25 |
| Total | \$1,794,026 | \$ 9.79 | \$9.29 | \$37.55 |
| OTHER COSTS | | | | |
| Depreciation | \$ 17,452 | \$ 0.09 | \$0.09 | \$ 0.36 |
| Shaft sinking and development write-off | 42,145 | 0.23 | 0.32 | 0.88 |
| Provision for Ontario mining taxes | 7,800 | 0.04 | 0.05 | 0.16 |
| Outside exploration | 3,172 | 0.02 | 0.02 | 0.07 |
| Total | \$ 70,569 | \$ 0.38 | \$0.48 | \$ 1.47 |
| Total Costs | \$1,864,595 | \$10.17 | \$9.77 | \$39.02 |

Mining

Stoping was done on eight levels, all of which were in the No. 3 internal shaft area. Owing to the greater depth of mining and the concentration of working places, general mine productivity dropped slightly during the year.

The grade of ore was up somewhat over that mined in 1960. This was due to a greater proportion of ore from the bottom levels.

Heavy ground conditions at depth, and the unavoidable concentration of working places on the three bottom levels, continues to make mining more difficult and costly.

In December, following a short period of testing, an ammonium nitrate-fuel-oil blasting agent was adopted to replace conventional high explosive for all primary blasting. The economies effected promise to be substantial and should help offset other rising costs.

Milling

The mill operated continuously throughout the year at an average daily rate of 502 tons as compared with 504 tons for the operating period in 1960.

The changes made as a result of the test work conducted by the Department of Mines and Technical Surveys in Ottawa in 1960 gave an improvement in extraction of over 1 percent in 1961.

General

At the request of, and for the account of, Aunor Gold Mines Limited, Delnite drove into Aunor ground 309 feet on the 3,250-foot level, 1,131 feet on the 3,875-foot level, and 830 feet on the 4,975-foot level.

The average number of employees was 261: 181 underground, and 80 on surface. G. A. Vary was manager.

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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 1961 was 3,510,140. The directors and officers were: A. W. White, president, and director; C. R. Diebold, vice-president and director; R. A. Jodrey, S. C. Smith, M. L. Urquhart, R. F. Rock, and L. I. Ross, directors; D. F. Burt, secretary; L. W. McIlmurray, assistant secretary; H. R. Heard, treasurer; L. V. Barbisan, assistant-treasurer. The head office is at 25 Adelaide Street West, Toronto 1. The mine address is Balmertown.

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

Mining and milling continued throughout 1961.

SHAFTS, DICKENSON MINE

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

No. 1 shaft was deepened a further 620.4 feet in 1961 to a total depth of 3,589 feet below the collar. The 21st, 22nd, and 23rd levels were established at vertical depths of 3,065, 3,215, and 3,365 feet, respectively, below the collar.

A total of 5,339 feet of drifting, 4,999 feet of crosscutting, and 4,731 feet of raising was completed. Total development footage to 31 December 1961 was as follows: 59,084 feet of drifts; 43,859 feet of crosscuts; 36,162 feet of raises. Diamond-drilling in 1961 consisted of 331 holes, totalling 58,682 feet, from underground.

New equipment installed was as follows:

MILL

1 thickener tank (wood stave, 28-ft. diameter, 22 ft. high).

UNDERGROUND

5 mine cars (48 cu. ft. Hudson, side-dump).

1 rocker shovel (Eimco No. 24).

1 pump (Mather and Platt, Plurovane, size 1).

The following is taken from the general manager's report for the year ending 31 December 1961:

General

Operating costs at the mine were up \$0.89 per ton milled over 1960. This was mainly due to shaft-deepening charges of \$1.38 per ton and a \$0.19 per ton increase in mine general expense. Exploration and development costs were down \$0.34 because the cost of work done on the old Detta claims was deferred. Mining costs were down \$0.30 per ton, reflecting a decrease in broken ore reserves of 30,000 tons. Mill recovery was improved from 91.2 percent in 1960 to 91.7 percent in 1961.

Dickenson was again the winner of the Red Lake District mine rescue competitions.

Analysis of Operating Costs

| | 1961 | | | 1960 |
|-----------------------------------|--------------------|----------------|----------------|----------------|
| | Total | Per Ton Milled | Per Ounce | Per Ounce |
| Shaft deepening | \$ 236,948 | \$ 1.38 | \$ 2.68 | \$ 0.14 |
| Exploration and development | 401,352 | 2.33 | 4.54 | 5.02 |
| Mining | 667,790 | 3.89 | 7.56 | 7.87 |
| Milling | 457,475 | 2.66 | 5.18 | 4.84 |
| Mine, general expense | 322,238 | 1.87 | 3.65 | 3.16 |
| Head office expense | 121,114 | 0.70 | 1.37 | 1.10 |
| Marketing charges | 19,279 | 0.11 | 0.22 | 0.30 |
| Total | \$2,226,196 | \$12.94 | \$25.20 | \$22.43 |

Mining

Broken ore totalling 143,727 tons remained in the stopes, a decrease of 16,704 tons from the previous year.

Of the 171,769 tons of ore hoisted, 26,190 tons was obtained from development, and 145,579 tons was obtained from stoping and stope preparation.

Stoping operations were carried on in the North C, South C, D, and F zones on the upper seventeen levels. Of the total ore hoisted, the percentages from the zones were: North C, 20.7 percent; South C, 54.7 percent; D, 15 percent; F, 6.5 percent; miscellaneous (E, G), 3.1 percent.

During the last quarter of the year one stope, on the 9th level in the North C zone, was started as a cut-and-fill stope using classified mill tailings as fill. The shrinkage-stope method of mining continued in use throughout the year for the remainder of the stopes. Tons broken per rock-drill shift in stopes and backstopes was 37.9 as compared with 36.2 in 1960. The average stope width was 5.6 feet as compared with 5.3 feet the previous year.

Ore Reserves

At 31 December 1961, positive ore reserves, broken and in place, were calculated to be 467,550 tons having an average grade of 0.543 ounce of gold per ton. This compares with 497,489 tons grading 0.552 ounce per ton at 31 December 1960.

Milling

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

| | 1961 | 1960 |
|--------------------------------|---------------------------|---------|
| Tons treated | 171,935 | 171,840 |
| Percent operating time | 98.44 | 98.43 |
| Tons treated per day | 471.1 | 469.5 |
| Average value mill heads | oz. of gold per ton 0.561 | 0.584 |
| Assay of mill tails | oz. of gold per ton 0.047 | 0.051 |
| Recovery | oz. of gold per ton 0.514 | 0.533 |
| Recovery | percent 91.7 | 91.2 |

The average number of employees was 262: 144 underground, and 118 on surface. F. A. Fell was general manager.

Dome Mines Limited

Dome Mines Limited was incorporated in July 1923, to succeed Dome Mines Company Limited. The authorized capitalization is 2,000,000 shares of no par value, of which 1,946,668 have been issued. The directors and officers were: C. W. Michel, chairman, treasurer, and director; J. B. Redpath, president and director; C. C. Calvin, vice-president, secretary, and director; W. R. Biggs,

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

Mining and milling continued throughout 1961.

SHAFTS, DOME MINE

| | Location | Inclination | Number of Compartments | Total Depth from Surface |
|---|--|-------------|---------------------------------------|--------------------------|
| No. 1 shaft ⁽¹⁾ | P.12866 | Vertical | 3 | feet 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 | | |
| 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 twp. | 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 twp. | Vertical | ———— | 60 |
| Temiskaming No. 2..... | NW. corner, NW. ¼, S. ½, lot 3, con. II, Tisdale twp. | Vertical | ———— | 26 |

⁽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 1961 consisted of 10,712 feet of drifting; 4,374 feet of crosscutting; and 3,649 feet of raising. Total development footage to 31 December 1961 was as follows: 400,149 feet of drifts; 182,865 feet of crosscuts; 231,704 feet of raises. Diamond-drilling in 1961 consisted of 496 holes, totalling 100,617 feet, from underground.

New equipment installed in 1961 was as follows: a vibrating pan feeder (Jeffrey, size 5, 36- x 60-in. pan) in No. 1 transfer house, crusher plant, and an exhauster (Sheldon Engineering Type C, with 24 DC dust separator and 300 ft. of 3-in. aluminium pipe and fittings for crusher-house vacuum cleaning).

The following is taken from the general manager's report for the year ending 31 December 1961:

Costs

The expenditure on development was \$939,669 or \$1.31 per ton, as compared with \$925,675 or \$1.29 per ton milled in 1960.

The expenditure on mining was \$3,412,673 or \$4.78 per ton, as compared with \$3,512,965 or \$4.92 per ton milled in 1960.

The total operating charges for the year were \$5,644,958 or \$7.90 per ton, as compared with \$5,691,468 or \$7.96 per ton milled in 1960.

Mining

The 714,700 tons of ore milled during the year were produced as follows:

| Source of Ore | Mined | Average Grade |
|------------------------|---------|---------------|
| | tons | dwt. per ton |
| From stopes | 621,600 | 5.22 |
| From development | 93,100 | 3.45 |
| Total | 714,700 | 4.99 |

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

| Source of Ore | Mined | Average Grade |
|---|---------|---------------|
| | tons | dwt. per ton |
| 5th level to surface | 3,428 | 3.32 |
| Ankerite veins | 192,045 | 4.38 |
| Area serviced by No. 6 internal shaft | 285,800 | 4.93 |
| Remainder of mine | 233,427 | 5.61 |
| Total | 714,700 | 4.99 |

Ore Reserves

Ore reserves at the close of the year were estimated at 2,455,000 tons with an average grade of 5.15 pennyweight as compared with 2,476,000 tons with an average grade of 5.18 pennyweight for 1960.

| Ore | 1961 | 1960 |
|--------------------|-----------|-----------|
| | tons | tons |
| Unbroken ore | 2,162,000 | 2,163,000 |
| Broken ore | 293,000 | 313,000 |
| Total | 2,455,000 | 2,476,000 |

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

Mill

Following are the milling results:

| | | |
|------------------------------------|--------------|---------|
| Ore treated | tons | 714,700 |
| Average per day worked | tons | 1,985 |
| Average grade of ore treated | dwt. per ton | 4.99 |
| Recovery | dwt. per ton | 4.88 |
| Recovery | percent | 97.68 |

General

Underground, beneficial effects are still being obtained from the conversion to hydraulic backfill; use of the new ammonium nitrate blasting agents and mine efficiency studies were effective in reducing underground costs.

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The first full year's operation of natural-gas-fired boilers as compared with stoker coal has shown substantial savings in fuel and labour. The new crushing plant was completed early in the year and is operating in a most satisfactory manner. The anticipated savings in operating labour and maintenance are being realized with further benefits still to be obtained during 1962.

The average number of employees was 891: 601 underground, and 290 on surface. C. P. Girdwood was general manager.

Hallnor Mines Limited

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

The property 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 1961.

The mine is serviced by the vertical, three-compartment No. 1 shaft, 3,477 feet deep, in the north half of lot 7, concession V, Whitney township. The inclined, two-compartment No. 2230 winze, collared at 3,354 feet, extends downwards to a vertical depth of 3,794 feet below surface.

Development work in 1961 consisted of 2,187 feet of drifting; 1,165 feet of crosscutting; and 1,126 feet of raising. Total development footage to 31 December 1961 was as follows: 62,697 feet of drifting, 17,079 feet of crosscutting, 22,643 feet of raising. Diamond-drilling in 1961 consisted of 265 holes, totalling 36,670 feet, from underground and 2 holes, totalling 1,809 feet, from surface.

The following is taken from the manager's report for the year ending 31 December 1961:

Stoping

Ore broken in stopes amounted to 114,200 tons, and the ore drawn off amounted to 117,440 tons. The broken-ore reserve was 7,820 tons at the year's end.

The tonnage hoisted from below the 17th level amounted to 67 percent of the total. Backfill placed in stopes amounted to 43,820 tons.

Ore Reserves

At 31 December 1961, the ore reserves above the 24th level were 178,100 tons at an average cut grade of 0.33 ounce gold per ton, as compared with 169,900 tons at 0.35 ounce per ton reported this time last year. The portion of this year's total remaining above the 8th level is 64,900 tons at an average cut grade of 0.27 ounce per ton.

Mill

The mill was in continuous operation throughout the year, excluding short shutdowns for repairs, inspections, and statutory holidays. The ball mill (8-by-8-ft.) operated for 98.4 percent of possible running time.

The tonnage milled averaged 333 tons per day as compared with 330 tons per day in 1960.

The mill treated 121,720 tons of ore averaging 0.32 ounce gold per ton, and with a recovery of 97.25 percent; gold recovery was 38,100 ounces, and an average price of \$35.49 per ounce was realized.

The average number of employees was 201: 125 underground, and 76 on surface. D. Bridger was manager.

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 4,896,485 shares have been issued. The directors and officers were: B. W. Lang, president and director; H. F. Brownbill, vice-president and director; R. F. Dewar, manager of mining operations and director; J. M. Godfrey, secretary and director; E. G. Bishop and J. B. Streit, directors; W. H. Maedel, treasurer. The head office is at 80 Richmond Street West, Toronto 1. The mine address is Box 130, Balmer-town.

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

Mining and milling continued throughout 1961.

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 1961 consisted of 549 feet of drifting, 1,024 feet of crosscutting, and 498 feet of raising. Total development footage to 31 December 1961 was as follows: 7,383 feet of drifts; 5,664 feet of crosscuts; 3,536 feet of raises. Diamond-drilling in 1961 consisted of 55 holes, totalling 13,028 feet, from underground.

A Petbow diesel generator (Vulcan Standby Unit, No. 14027) was installed in the mill at the old Starratt-Olsen property.

A total of 105,257 tons of ore was hoisted, 113,309 tons was milled. The mill averaged 310 tons per day.

The average number of employees was 80: 47 underground, and 33 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, chairman of the board and director; A. A. McMartin, president and director; N. A. Timmins, vice-president and director; P. C. Finlay, vice-president, secretary, and director; Hon. Edouard Asselin, Duncan McMartin, J. A. McDougald, M. W. McCutcheon, and J. Y. Murdoch, directors; C. G. Cowan, secretary. The mine office and head office are at Timmins. The general office is at 44 King Street West, Toronto 1.

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

HOLLINGER MINE

Mining and milling operations continued throughout 1961.

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SHAFTS, HOLLINGER MINE⁽¹⁾

| | Claim No. | Number of Compartments | Total Depth from Surface |
|---|---------------------------|------------------------|--------------------------|
| Main shaft..... | P.13156 | 3 | feet 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 level.

(3) Filled from the 1,550- to 2,750-foot level; travelway from the 2,750- to 3,950-foot level.

(4) Abandoned and filled from surface to the 200-foot level; travelway from the 200- to 425-foot level.

Development work during the year consisted of 6,261 feet of drifting; 2,631 feet of crosscutting; and 29,696 feet of rock passes, development, and stope raising. Total development, from 1931 to 31 December 1961, is as follows: 1,296,290 feet of drifts; 682,243 feet of crosscuts; and 903,566 feet of raises. Diamond-drilling in 1961 consisted of 971 holes, totalling 89,112 feet, from underground and 3 holes, totalling 209 feet, from surface.

The following is taken from the manager's report for the year ending 31 December 1961:

Operating cost increases were relatively greater than the higher bullion receipts, so that a larger operating loss was incurred in 1961 than was experienced in 1960.

Comparative figures for operating performance and costs per ton for the two years are:

| | 1960 | 1961 |
|---|-------------|--------------|
| Days worked..... | 271 | 269 |
| Milled..... tons | 1,051,222 | 1,056,323 |
| Millhead grade per ton..... oz. | 0.278 | 0.277 |
| Millhead value per ton..... | \$9.51 | \$9.88 |
| Average value of tailings per ton..... | \$0.26 | \$0.27 |
| Gold produced..... oz. | 284,118 | 284,378 |
| Average value received per oz of gold sold..... | \$34.00 | \$35.40 |
| Bullion production..... | \$9,720,409 | \$10,147,180 |
| Operating cost (before taxes and depreciation)..... | \$9,853,993 | \$10,305,557 |

COSTS

| | Per Ton | |
|---|---------|--------|
| | 1960 | 1961 |
| Mining..... | \$6.17 | \$6.41 |
| Milling..... | 0.79 | 0.81 |
| General..... | 1.11 | 1.17 |
| Vacation pay, insurance, and other employee benefits..... | 0.54 | 0.55 |
| Administrative..... | 0.76 | 0.82 |
| Total..... | \$9.37 | \$9.76 |

Productivity was the same as 1960 at 2.53 tons per man shift. Some production time was lost owing to a severe storm on 1 September, which caused part of the mine to be flooded, and disrupted the ore-hoisting and milling operations.

The decrease in the value of the Canadian dollar in relation to the United States dollar resulted in a higher gold price, which was equal to \$36.50 at the end of the year. The price varied between \$34.45 per ounce and \$36.50 per ounce and averaged \$35.40 per ounce sold.

The greater cost of producing a ton of ore in 1961 over 1960 is mainly attributable to increases in the following items: stope preparation and development, \$0.13; labour, \$0.10; power, \$0.04; and flood damage, \$0.06.

The production of 1,056,000 tons of mill feed reduced the ore reserve by 201,000 tons to 2,035,000 tons having a grade estimated to average 0.294 ounce of gold per ton. The value per ton, with gold at \$35.00 per ounce, is \$10.29. At the end of 1960 the grade was 0.298 ounce per ton, and the value was \$10.45 per ton.

The method used to calculate the ore reserve shows the amount of gold contained in a specific tonnage of rock, and provides a true picture of the effect of work done on the ore supply. The ability to process this reserve depends on the many factors that influence costs of production, recovered values, and amount of subsidy payments. Physical limitations will inevitably result in some of the indicated ore reserve being uneconomic to mine, and any adverse change in the factors mentioned above would tend to worsen this situation.

The average number of employees was 1,627: 1,021 underground, and 606 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 1961.

SHAFTS, ROSS MINE

| | Location | Inclination | Number of Compartments | Sinking in 1961 | Depth from Surface |
|---|----------------------------------|-------------|------------------------|-----------------|--------------------|
| No. 1 shaft..... | N. ½ lot 1, con. II, Hislop twp. | Vertical | 3 | 489 | 2,646 |
| No. 2 winze (below 300-foot level)..... | — | Vertical | 2 | — | 1,535 |

No. 1 shaft was sunk 489 feet in 1961; the 2,250-, 2,400-, 2,550-foot levels, and a spill level at 2,610 feet, were established.

Development work in 1961 consisted of 858 feet of drifting; 2,669 feet of crosscutting, and 3,867 feet of raising. Total development footage to 31 December 1961 was as follows: 39,600 feet of drifts; 33,357 feet of crosscuts; and 29,243 feet of raises. Diamond-drilling in 1961 consisted of 74 holes, totalling 21,283 feet, from underground.

The following is taken from the resident manager's report for the year ending 31 December 1961:

The sinking of the main shaft and the preparation of ore and waste handling facilities were effected without reduction of milling capacity. The increased operating cost is attributable to expanded development activity on the new lower levels.

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Comparative production statistics for 1960 and 1961 are shown:

PRODUCTION

| | 1960 | 1961 |
|--|-----------|-----------|
| Worked days | 345 | 347 |
| Milled tons | 140,154 | 145,291 |
| Millhead grade per ton oz. | 0.151 | 0.158 |
| Millhead value per ton | \$5.64 | \$5.86 |
| Average value of tailings per ton | \$0.42 | \$0.45 |
| Gold produced oz. | 19,443 | 21,080 |
| Average value received per ounce of gold sold | \$33.94 | \$35.47 |
| Bullion production | \$731,041 | \$784,909 |
| Operating cost (before taxes and depreciation) | \$779,448 | \$846,652 |

COSTS

| | Per Ton | |
|--|---------|--------|
| | 1960 | 1961 |
| Mining charges | \$2.48 | \$2.62 |
| Milling charges | 1.73 | 1.82 |
| General charges | 0.74 | 0.78 |
| Vacation pay, insurance, and other employee benefits | 0.23 | 0.24 |
| Administrative charges | 0.38 | 0.37 |
| Total | \$5.56 | \$5.8 |

There were no compensable accidents in 1961.

The extension of the main shaft will be put into operation at the end of February 1962. Costs of the shaft, which is 18- by 10-feet and contains three compartments, and facilities, were:

| | |
|---|------------------|
| Sinking; 1,050 feet to 2,550-foot level | \$293,555 |
| Loading-pockets, ore- and waste-passes | 163,870 |
| Equipment | 58,105 |
| Estimated 1962 cost to complete project | 32,440 |
| | \$547,970 |

Development of the new lower levels has been commenced to examine favourable geological ore zones. At the year's end, a total of 905 feet of crosscutting towards these zones had been done at a cost of \$29,000.

The ore reserve at the end of 1961 was 501,000 tons averaging 0.180 ounce of gold per ton, and equal to \$6.30 per ton with gold valued at \$35.00 per ounce. These figures are unchanged from those reported for 1960, after producing 145,300 tons of mill feed.

The average number of employees was 102: 47 underground, and 55 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 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; W. H. Maedel, secretary-treasurer and director; J. A. Hackett, director. The head office is at 80 Richmond Street West, Toronto 1. The mine address is Pamour.

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

SHAFTS, HUGH-PAM PORCUPINE MINE

| | Claim No. | Inclination | Number of Compartments | Depth |
|---|-----------|-------------|------------------------|----------------|
| Mulholland shaft..... | P.12708 | Vertical | 2 | feet (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 1961 consisted of 105 feet of drifting, 157 feet of crosscutting, and 509 feet of raising. Total development footage to the end of 1961 was as follows: 17,155 feet of drifting; 1,826 feet of crosscutting; and 6,181 feet of raising. Diamond-drilling in 1961 consisted of 26 holes, totalling 1,350 feet, from underground.

The following is taken from the mine manager's report for the year ending 31 December 1961:

Milling

During the year, 37,077 tons of ore were mined and milled.

Average recovery was 0.192 ounce of gold or \$6.86 per ton milled based on the Mint price, plus an additional \$1.76 per ton milled under the *Emergency Gold Mining Assistance Act*.

Ore Reserves

Proven-ore reserves are calculated to be 46,000 tons having an average uncut grade of 0.29 ounce of gold per ton or a grade cut to one ounce of 0.20 ounce per ton.

Operating costs for the 37,077 tons mined and milled during the year, including head office administration and general expenses, amounted to \$7.94 per ton.

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

Kerr Addison Gold Mines Limited

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

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

Mining and milling continued throughout 1961.

SHAFTS, KERR-ADDISON MINE

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

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Development work in 1961 consisted of 11,568 feet of drifting, 2,167 feet of crosscutting, and 6,017 feet of raising. Total development footage to 31 December 1961 was as follows: 209,249 feet of drifts; 82,252 feet of crosscuts; 153,976 feet of raises. The total footage includes some development work on the Chesterville and Arjon properties. Diamond-drilling in 1961 consisted of 224 holes, totalling 35,865 feet, from underground.

Equipment added in 1961 included the following:

- 1 motor, at the 5,700-foot-level crusher station (125-hp., Canadian Westinghouse 3/25/220).
- 9 scrapers, for slushers in No. 3 shaft area (Amsco 42-in., Joy Mfg. Co. Ltd.).
- 1 locomotive, No. 4 shaft area, (23-hp. diesel, Hunslet locomotive).
- 3 transformers, No. 4 shaft area (225-kva., John Inglis Co. Ltd.).
- 1 pump, at 5,000-foot level, No. 4 shaft (pulsometer turbine T14/10 cell and 200-hp. motor Laurie & Lamb).
- 1 amperage controller, at 5,000-foot level, No. 4 shaft (rated 200 hp.—2,200 v., Canadian General Electric).

The following is taken from the manager's report for the year ending 31 December 1961:

Summary of Operating Results

PRODUCTION, 1961 AND 1960

| | 1961 | 1960 |
|---|-----------------|-----------------|
| Milled..... tons | 1,490,319 | 1,667,638 |
| Average milled per day..... tons | 4,083.1 | 4,556.4 |
| Total gold recovered..... oz. | 520,867.17 | 592,244.59 |
| Total silver recovered..... oz. | 29,309.07 | 33,370.60 |
| Average mill-head per ton (bullion plus tails)..... oz. | 0.3563 | 0.3633 |
| Average mill-head value per ton (gold at \$35 per oz.)..... | \$12.471 | \$12.715 |
| Recovery..... percent | 98.1 | 97.8 |
| Total realized value of bullion (Canadian funds)..... | \$18,615,841.51 | \$20,420,105.55 |
| Total realized value of bullion per ounce of gold..... | \$35.74 | \$34.48 |
| Total realized value of bullion per ton milled..... | \$12.491 | \$12.245 |

COST SUMMARY

| | 1961 | | 1960 | |
|---|------------------------|----------------|------------------------|----------------|
| | In Full | Per Ton | In Full | Per Ton |
| Development..... | \$ 757,404.88 | \$0.508 | \$ 919,767.68 | \$0.552 |
| Stope development..... | 279,172.57 | 0.187 | 246,324.96 | 0.148 |
| Mining..... | 3,791,208.25 | 2.544 | 3,825,619.69 | 2.294 |
| Haulage..... | 540,612.66 | 0.363 | 578,361.59 | 0.346 |
| Hoisting..... | 418,492.11 | 0.281 | 408,864.38 | 0.245 |
| General mine charges..... | 2,354,372.17 | 1.580 | 2,287,265.82 | 1.371 |
| Crushing and conveying..... | 244,124.93 | 0.164 | 238,525.34 | 0.143 |
| Milling..... | 1,417,585.92 | 0.951 | 1,479,002.29 | 0.887 |
| General expense..... | 694,134.22 | 0.466 | 729,768.38 | 0.438 |
| Bullion marketing..... | 115,211.40 | 0.077 | 135,950.84 | 0.082 |
| Total..... | \$10,612,319.11 | \$7.121 | \$10,849,450.97 | \$6.506 |
| Net operating profit at mine (before provision for depreciation, taxes and head office expense)..... | \$ 8,003,522.40 | \$5.370 | \$ 9,570,654.58 | \$5.739 |

Ore Reserves

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

| Level | Ore | Grade |
|---------------------------------------|-----------|-------------|
| | tons | oz. per ton |
| Surface to 1,600-foot..... | 557,975 | 0.2753 |
| 1,600-foot to 2,500-foot..... | 2,392,745 | 0.3090 |
| 2,500-foot to 3,700-foot..... | 2,174,135 | 0.4236 |
| 3,700-foot to 4,550-foot horizon..... | 2,636,238 | 0.5346 |
| Total Reserve at the end of 1961..... | 7,761,093 | 0.4153 |
| Total Reserve at the end of 1960..... | 9,074,689 | 0.4152 |

Broken-ore reserves at the end of 1961, amounting to 39,913 tons having a grade of 0.3215 ounce per ton, are included in the foregoing figures. The total ore reserve decreased by 1,313,596 tons during the year, while the tonnage milled exceeded the new ore added by 1,439,725 tons. The difference, a gain of 126,129 tons, may be attributed to dilution, additional ore won in mining, and some minor revisions of ore estimates.

Mine Development and Mining

At No. 4 shaft, the ore-pass and the waste-pass systems (including the control chutes, dumps, and dust doors), the 5,700-foot level crushing station, the 5,900-foot level loading-pocket, and the 2,500-foot long, 36-inch conveyor from No. 4 shaft to No. 3 shaft were all completed early in the year and were in use by mid-March.

The main sump and pumping station were excavated on the 5,000-foot level, and the two pumps and ancillary equipment were installed. Either pump will lift water to the 3,850-foot-level sump at No. 3 shaft at a minimum rate of 350 U.S. gallons per minute.

A 3-inch borehole, which is used for the distribution of hydraulic backfill, was drilled from the 3,700-foot level to the 4,200-foot level.

The return-air-raise and the escapement-raise systems were extended down to the 4,200-foot level in preparation for mining, with one raise serving both purposes between the 4,000-foot and 4,200-foot levels.

Following the completion in February of the program of diamond-drilling to outline the orebodies, drifting, and crosscutting in preparation for mining was commenced on the 3,850-, 4,000-, 4,200-, and 4,400-foot levels, and was completed to the extent required for the initial production schedules. Stope preparation, stoping, and the driving of stope service raises were well underway on these levels at the year's end. The total ore produced in development and mining operations at No. 4 shaft during the year amounted to 116,746 tons, an average of 320 tons per day.

Exploration of the 4,800- and 5,600-foot levels continued during the year. On the 4,800-foot level, the east drift was completed, and the west drift was advanced. Up to the end of 1961, a total strike length of 4,970 feet had been covered, with about 1,030 feet of drift remaining to be driven. On the 5,600-foot level, the crosscut was extended through a narrow section in the zone of talcose schist, south of which the east and west drifts are being driven. At the year's end, a strike length of 2,800 feet had been covered; about 3,400 feet of drifting remained to be done.

Stope development, consisting mainly of the construction of timbered haulageways through cut-and-fill mining areas, was confined largely to the No. 21 orebody, with work being done on the 2,800-, 3,250-, 3,550-, 4,000-, 4,200-, and 4,400-foot levels.

Pillar mining was started in two pillars in No. 6 orebody on the 2,200-foot level; one pillar in No. 14 orebody on the 1,600-foot level; four pillars in No. 16 orebody on the 2,650-foot level; and in four pillars in No. 21 orebody on the 1,600-foot and 2,500-foot levels.

The distribution of ore production from the various sections of the mine is summarized in the following table:

| Source of Ore | 1961 | | 1960 | |
|-------------------------------------|-----------|---------|-----------|---------|
| | tons | percent | tons | percent |
| Surface to 1,900-foot level..... | 352,282 | 23.7 | 504,909 | 30.1 |
| 1,900-foot to 2,500-foot level..... | 377,487 | 25.4 | 439,870 | 26.2 |
| 2,500-foot to 3,100-foot level..... | 252,382 | 16.9 | 255,939 | 15.3 |
| 3,100-foot to 3,700-foot level..... | 389,450 | 26.2 | 470,630 | 28.1 |
| Below 3,700-foot level..... | 116,746 | 7.8 | 4,483 | 0.3 |
| Total Ore Produced..... | 1,488,347 | 100.0 | 1,675,831 | 100.0 |

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Because surplus mill capacity was available and the price received for gold was higher, it became economic during 1961 to include a lower grade of marginal material as ore. Greater dilution in some sections of the mine, due to ground conditions and abnormal irregularities in the ore outlines, along with the foregoing factor, resulted in a slightly lower average grade of the ore milled.

A summary of ore broken by the different mining methods employed is given in the following table. A minor amount of ore was broken in shrinkage stopes and development headings, with cut-and-fill mining of several types accounting for the bulk of the tonnage broken. During 1961 there was a considerable increase, amounting to 160,803 tons over the previous year, in ore broken by square-set mining methods.

| Mining Method | 1961 | | 1960 | |
|---|------------------|--------------|------------------|--------------|
| | tons | percent | tons | percent |
| Cut-and-fill stoping..... | 930,119 | 66.1 | 1,101,226 | 69.7 |
| Cut-and-fill-pillar recovery..... | 40,661 | 2.9 | 133,579 | 8.4 |
| Total Cut-and-fill Mining..... | 970,780 | 69.0 | 1,234,805 | 78.1 |
| Square-set stoping..... | 213,695 | 15.2 | 109,146 | 6.9 |
| Square-set pillar recovery..... | 153,869 | 10.9 | 97,615 | 6.2 |
| Total Square-set Mining..... | 367,564 | 26.1 | 206,761 | 13.1 |
| Total Cut-and-fill and Square-set Mining.. | 1,338,344 | 95.1 | 1,441,566 | 91.2 |
| Shrinkage stoping..... | 20,804 | 1.5 | 114,617 | 7.3 |
| Total Mining..... | 1,359,148 | 95.6 | 1,556,183 | 98.5 |
| Development ore..... | 47,330 | 3.4 | 23,797 | 1.5 |
| Total Ore Broken..... | 1,406,478 | 100.0 | 1,579,980 | 100.0 |
| Percentage of tons milled..... | ————— | 94.4 | ————— | 94.7 |

Hydraulic fill, produced from the mill tailings and augmented with screened pit sand as required, constituted the major proportion of the backfill used. Development waste was disposed of as fill into some of the worked-out areas in the upper part of the mine.

The table summarizes backfilling operations during the year.

| | 1961 | | 1960 | |
|---|----------------|--------------|----------------|--------------|
| | cu. yds. | percent | cu. yds. | percent |
| Backfill Placed: | | | | |
| Cut-and-fill stopes..... | 579,488 | 80.2 | 623,300 | 79.1 |
| Open stopes and storage..... | 143,243 | 19.8 | 164,373 | 20.9 |
| Total..... | 722,731 | 100.0 | 787,673 | 100.0 |
| Source of backfill: | | | | |
| Hydraulic sand from mill tailings..... | 627,379 | 86.8 | 698,873 | 88.7 |
| Screened pit sand..... | 46,099 | 6.4 | 5,123 | 0.7 |
| Total Hydraulic Fill..... | 673,478 | 93.2 | 703,996 | 89.4 |
| Development waste and other dry fill..... | 49,253 | 6.8 | 83,677 | 10.6 |
| Total Backfill..... | 722,731 | 100.0 | 787,673 | 100.0 |
| Percentage of mill tailings recovered as backfill.... | ————— | 51.7 | ————— | 51.4 |

The average number of employees was 1,445: 1,005 underground, and 440 on surface. R. J. Beggs was manager.

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; Miss 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 1961.

SHAFTS, LAKE SHORE MINE

| | Claim No. | Inclination | Number of Compartments | Total Depth from Surface |
|---|-----------|-------------|------------------------|--------------------------|
| No. 1 shaft (surface to 2,200-foot level) . . | L.1557 | Vertical | 3 | feet 2,250 |
| No. 1 shaft extension (2,000-4,450-foot level) ⁽¹⁾ | — | Vertical | 3 | 4,507 |
| 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 | 6,124 |

(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 3,383 feet of drifting; 327 feet of crosscutting; and 1,431 feet of raising. Total development footage to 31 December 1961 was as follows: 277,365 feet of drifts; 107,276 feet of crosscuts; 152,886 feet of raises. Diamond-drilling in 1961 consisted of 152 holes, totalling 16,003 feet, from underground.

New equipment installed included an oversize elevator in the mill (company made) and a pump (Aldrich 3½ x 6 in.).

The following is taken from the general manager's report for the year ending 31 December 1961:

Milling

In the year, the mill treated 169,785 tons of Lake Shore ore for an average daily milling rate of 465 tons, compared with 175,501 total tons and 480 tons per day in 1960. Recovery was 97.12 percent of contained gold in 1961, as against 97.38 percent in 1960. The percentage recovery was adversely affected by the lower average grade of the ore treated during the year.

The mill also treated 159,078 tons of ore from Wright-Hargreaves Mines Limited, equivalent to 436 tons per day for the period. Additionally, 152,876 tons of cyanide tailings from the mill of Macassa Gold Mines Limited, were processed in the tailings retreatment plant.

Ore Reserves

In 1961, after milling 169,785 tons of ore, there was an addition of 20,740 tons to the ore reserves, which at the end of the year totalled 711,410 tons with an average gold content of 0.421 ounce per ton. In the year the average grade of the reserves increased by 0.012 ounce of gold per ton, reflecting the substantially higher average gold content of the ore developed during the year.

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Operating Costs

Operating expense for 1961, before provision for depreciation, totalled \$2,450,632 equivalent to \$14.43 per ton of ore milled, as compared with \$2,515,025 or \$14.33 per ton in 1960. Operating costs per ton of ore milled for the last two years are tabulated as follows:

| | Per Ton Milled | |
|---|-----------------|-----------------|
| | 1961 | 1960 |
| Mine development..... | \$ 1.359 | \$ 1.196 |
| Mining..... | 7.552 | 7.679 |
| Milling..... | 2.222 | 2.107 |
| Marketing expenses..... | 0.095 | 0.109 |
| General expense at the property..... | 1.954 | 1.939 |
| Mine office and supervision..... | 0.880 | 0.960 |
| Provincial mining tax..... | 0.002 | 0.005 |
| Administrative and corporate expense..... | 0.360 | 0.335 |
| Total Operating Cost..... | \$14.434 | \$14.330 |

The rise in total operating cost of \$0.104 per ton of ore milled is more than accounted for by the higher charge for mine development.

Mining

Ore production was from 23 of the 58 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 Stopping | Total | Of Total | Hoisting Stages |
|-------------------------------------|------------------|----------------|----------------|--------------|-----------------|
| | tons | tons | tons | percent | |
| Surface to 3,950-foot level..... | 47,976 | 47,976 | 47,976 | 28.2 | 1 |
| 4,075-foot to 6,075-foot level..... | 1,456 | 56,393 | 57,849 | 34.1 | 2 |
| Below 6,075-foot level..... | 19,632 | 44,328 | 63,960 | 37.7 | 3 |
| Total..... | 21,088 | 148,697 | 169,785 | 100.0 | — |

Of the total ore produced, 12.4 percent came from development work compared with 8.5 percent in 1960.

Ore production from the levels below the 6,075-foot horizon amounted to 37.7 percent of the mine total, compared with 24.6 percent in 1960.

The average number of employees was 439: 260 underground, and 179 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 have been issued. The directors and officers were: K. J. Springer, president and director; J. H. C. McClelland, vice-president and director; F. E. Hall, secretary-treasurer and director; S. H. Robinson and J. R. Cryderman, directors; G. A. McKay, director and mine manager. The head office is at 12 Richmond Street East, Toronto 1. The mine address is Beardmore.

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

Mining and milling continued throughout 1961.

SHAFTS, LEITCH MINE

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

Development work during the year consisted of 1,770 feet of drifting; 19 feet of crosscutting; and 1,245 feet of raising. Total development footage to 31 December 1961 was as follows: 61,215 feet of drifts; 23,756 feet of crosscuts; 28,335 feet of raises. Diamond-drilling in 1961 consisted of 11 holes, totalling 4,437 feet, from underground.

The following is taken from the director and mine manager's report for the year ending 31 December 1961:

Ore Reserves

Ore reserves to the 30th level are estimated at 65,241 tons grading 1.350 ounces per ton, or a total of 88,090.26 ounces.

Hoisting

Some 43,257 tons of ore were hoisted; 4,837 tons or 11.2 percent from drifts; 2,525 tons or 5.8 percent from raises; 35,895 tons or 83.0 percent from stopes.

Some 5,971 tons of waste were hoisted.

Milling

Some 34,953 tons of ore were milled after sorting 9,542 tons of waste from the run-of-mine feed. The average milling rate was 97.4 tons per day, based on 359 days operation during the year. Average recovery was 1.089 ounces of gold per ton milled. Tailing losses averaged 0.036 ounce per ton milled. Extraction was 96.70 percent.

Costs

Operating costs for the year 1961 are as follows:

| | Per Ton Milled |
|--|----------------|
| EXPLORATION AND DEVELOPMENT | |
| Crosscutting | \$ 0.03 |
| Drifting | 2.16 |
| Raising | 1.19 |
| Underground diamond-drilling | 0.27 |
| Deferred development (shaft-sinking and station cutting) | 1.43 |
| | <hr/> |
| | \$ 5.08 |
| Mining | 15.77 |
| Milling | 5.78 |
| | <hr/> |
| Total Operating Cost at the Mine | \$26.63 |

The above total operating cost of \$26.63 per ton milled shows a substantial reduction from last year's figure of \$29.37. The decrease is due to the smaller amount of development work and the greater tonnage of ore coming from development, which in turn caused a reduction in the requirements from stoping. The comparisons of costs from 1960 to 1961 were as follows: exploration and development \$5.44 and \$5.08 per ton milled; mining \$18.07 and \$15.77; milling \$5.85 and \$5.78.

The average number of employees was 127: 62 underground, and 65 on surface. G. A. McKay was manager.

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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 3,974,005 shares have been issued. The directors and officers were: M. H. Greenberg, president and director; T. A. Jones, vice-president and director; Reino Jalonen, Gordon Hogan, R. B. Krize, Dolpheus Portelance, and M. J. Plesha, directors; I. A. MacNaughtan, secretary-treasurer. The head office is at 17 Queen Street East, Toronto 1. The mine address is Sapawe.

The property consists of fifty-two 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.

Operations continued from 1 January to 13 August, and 1 November to 31 December, 1961.

The vertical, three-compartment No. 1 shaft collared in claim F.F.3417 was sunk a further 325 feet in 1961 to a total depth of 351 feet below the collar. The first and second levels were established at vertical depths of 172 and 322 feet below the collar. Development footage in 1961 consisted of 56 feet of drifts and 160 feet of crosscuts on the first level, 75 feet of drifts and 200 feet of crosscuts on the second level; this is also the total to 31 December 1961. Some 12 diamond-drill holes totalling 4,411 feet were completed from surface. A water tank (24,000-gal.) was erected, and the shafthouse sheeted-in, during the operations in 1961.

J. J. Harris was manager; the average number of employees supplied by the contractor was eight.

Macassa Gold 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 had been issued. Bicroft Uranium Mines Limited was incorporated in April 1955, with an authorized capitalization of 4,000,000 shares of \$1 par value, of which 3,057,475 had been issued. On 1 November 1961 the two companies were amalgamated under the name of Macassa Gold Mines Limited on a basis of one share of Macassa Gold Mines Limited for one share of Macassa Mines Limited or five shares of Bicroft Uranium Mines Limited. The authorized capitalization was increased to 4,000,000 shares of \$1 par value, of which 3,089,163 have been issued. The directors and officers were: R. A. Bryce, president and director; J. D. Bryce, executive vice-president and director; J. C. L. Allen, S. J. Bird, J. G. Boeckh, C. C. Huston, and R. C. Stanley Jr., directors; Larmour Soliague, assistant to the president; G. D. Pattison, secretary-treasurer; H. W. Salthouse, assistant secretary-treasurer. The head office is at 85 Richmond Street West, Toronto 1; the executive office is at 25 Adelaide Street West, Toronto 1. The mine address of the Macassa Division is Kirkland Lake. A report on the Bicroft Division is found in the Uranium section of this report under Macassa Gold Mines Limited, Bicroft Division.

MACASSA DIVISION

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

Mining and milling operations continued throughout 1961.

SHAFTS, MACASSA DIVISION

| | Claim No. | Inclination | Number of Compartments | Depth from Surface |
|---|-----------|-------------|------------------------|--------------------|
| | | | | feet |
| Elliot 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 | 6,272 |

⁽¹⁾Not being used.

No. 2 winze was sunk 516.5 feet in 1961 to a total depth of 6,272 feet below surface. Development work during the year consisted of 3,036 feet of drifting, 1,009 feet of crosscutting, and 1,141 feet of raising. Total development footage to 31 December 1961 was as follows: 142,091 feet of drifts; 45,696 feet of crosscuts; 29,497 feet of raises. Diamond-drilling in 1961 consisted of 108 holes, totalling 14,921 feet, from underground.

New equipment installed included the following:

- 1 tank for muriatic acid at mill site.
- 3 battery-charging rectifiers (Powertronic, Northern Electric Co. Ltd.).
- 1 skip and cage (aluminium and steel, Wabi Iron Works Ltd.).
- 2 sheave wheels (United Steel Corp. Ltd.).
- 1 stoper (JR 38, Canadian Ingersoll-Rand Co.).
- 2 air slushers (Gardner Denver Co. Ltd.).

The following is taken from the mine manager's report for the year ending 31 December 1961:

Milling

The mill rate per calendar day was 419.6 tons. For the year, 153,171 tons of ore were milled, with an over-all extraction of 93.68 percent.

Costs

| Distribution | Costs 1961 | | Costs 1960 | |
|---|--|----------------------|--|-----------|
| | 68,380.115 ounces recovered from 153,171 tons milled | | 69,778.097 ounces recovered from 149,862 tons milled | |
| | per ton | per ounce | per ton | per ounce |
| Development and exploration..... | \$ 1.743 | \$ 3.905 | \$ 1.83 | \$ 3.93 |
| Mining..... | 7.432 | 16.648 | 7.20 | 15.45 |
| Milling..... | 1.990 | 4.459 | 2.02 | 4.34 |
| Undistributed mine operating charges..... | 0.462 | 1.034 | 0.50 | 1.07 |
| Administration and head office..... | ⁽¹⁾ 0.511 | ⁽¹⁾ 1.144 | 0.57 | 1.23 |
| Total..... | \$12.138 | \$27.190 | \$12.12 | \$26.02 |
| Depreciation..... | ⁽²⁾ 0.213 | ⁽²⁾ 0.476 | 0.26 | 0.57 |
| Provision for municipal, provincial, and federal taxes..... | ⁽³⁾ 0.603 | 1.352 | ⁽³⁾ 0.88 | 1.89 |
| Total..... | \$12.954 | \$29.018 | \$13.26 | \$28.48 |

⁽¹⁾To 31 October 1961.

⁽²⁾Head office not included in depreciation.

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

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Ore Reserves

Resultant calculations based on samples from drifting, raising, and the extension of known veins by stoping operations show ore reserves at 31 December 1961:

| Ore | Reserve | Average Grade | Value (Gold at \$35 per ounce) |
|-------------------------|-----------------|-----------------------|--------------------------------------|
| Unbroken | tons 795,700 | oz. per ton 0.4405 | \$15.42 |
| Broken | 41,870 | 0.3949 | \$13.82 |
| Total and Average | 837,570 | 0.4383 | \$15.34 |

Note: Dilution factor of 10 percent applied to grade only.

The unbroken-ore reserve is down 45,300 tons, and broken ore is down 2,450 tons; therefore, the total reserves are down 47,750 tons. Average grade is \$15.34 compared with \$15.64 for 1960. The drop in reserves was expected, because lateral development work was curtailed in order that development costs, including the shaft deepening program, would remain at the same level as in previous years.

The average number of employees was 306: 208 underground, and 98 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 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 2,365,487 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 which is the McIntyre mine, consisting of 3,542 acres in Tisdale township, Porcupine area, District of Cochrane. In 1959, six claims, consisting of 240 acres adjoining the McIntyre mine on the east, had been purchased from Central Porcupine Mines Limited. In 1960 all the assets and undertakings of Castle-Trethewey Mines Limited were purchased by McIntyre, and the Castle mine was operated as a division of McIntyre.

Mining and milling at the McIntyre mine continued throughout 1961.

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; the internal shaft was raised from the 6,825- to the 6,575-foot level and sunk 1,064 feet below the 6,825-foot level to a total depth of 7,889 feet below surface. The 6,975-, 7,125-, 7,275-, 7,425-, 7,575-, 7,725-, and 7,875-foot levels were established at depths of 150, 300, 450, 600, 750, 900, and 1,050 feet, respectively, below the collar.

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 feet 4 to bottom | 2,389 |
| No. 6 shaft..... | P.13710 | 3 to 1,050 feet 4 to bottom | 3,015 |
| No. 7 shaft ⁽¹⁾ | P.13318 | 2 to 200 feet 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-foot level)..... | — | 4 | 7,007 |
| No. 14 internal (below 3,750-foot level)..... | — | 4 | 7,094 |
| No. 15 internal (below 6,825-foot level)..... | — | 4 | 7,889 |
| No. 16 winze (below 5,500-foot level) ⁽²⁾ | — | 3 | 6,837 |

⁽¹⁾Not in use.

⁽²⁾Accessible from Coniaurum mine only; name changed to No. 16 winze from C.C. winze in 1961.

Development work during the year consisted of 15,215 feet of drifting, 14,026 feet of crosscutting, and 1,334 feet of raising. Total corrected development footage to 31 December 1961 was as follows: for gold—639,770 feet of drifts; 289,167 feet of crosscuts; 59,786 feet of raises; for copper—218 feet of drifts; 9,995 feet of crosscuts; 256 feet of raises. Diamond-drilling in 1961 consisted of 1,729 holes, totalling 264,043 feet, from underground.

New equipment added included the following:

- 1 dump truck (International, model B-160, 3-ton).
- 1 tractor (Utility diesel, model 65, 52 hp.).
- 2 steam boilers, natural-gas fuel (Eclipse Supermatic, input 5,250,000 Btu. per hr.).
- 1 storage-battery locomotive (Atlas, type Q3, ½-ton).
- 3 pumps (Mather and Platt, model 11A-8 CHR).
- 1 compressor (Ingersoll-Rand, XVHE-2).

The following is taken from the annual report for the year ending 31 December 1961:

The geological re-study of the mine was completed during the year. Recommendations for exploratory drives and diamond-drilling have been reviewed, and some work in this connection has already been initiated.

On the 500-foot level of the Platt veteran claim, two holes intersected veining of ore grade over fair widths in an interbedded tuff in the Vipond flow series. A crosscut is being driven to reach this zone. The 5,975-foot level was driven eastward into ground purchased from Central Porcupine Mines Limited, and some ore has been put in sight. A drive to develop the same section is under way on the 6,125-foot level.

In the copper ore zone in the Pearl Lake porphyry, definitive drilling has been carried out between the 1,725- and 3,000-foot horizons preparatory to laying out development for mining. The ore occurs in 19 separate blocks of mineable shape and size, with tonnages ranging from 60,000 to 675,000 tons. During the year, \$439,571 was spent on exploring and developing these blocks, the cost of which has been deferred to future operations.

Capital expenditures in 1961 amounted to \$273,592, of which \$183,334 was for underground equipment and the balance for surface plant and additions to buildings.

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OPERATING COSTS

| | 1961 | | 1960 | |
|--|--------------------|----------------|--------------------|----------------|
| | Total | Per Ounce Gold | Total | Per Ounce Gold |
| Mine development and exploration | \$1,090,272 | \$ 4.94 | \$ 975,503 | \$ 4.48 |
| Breaking and stoping | 5,430,763 | 24.61 | 5,357,795 | 24.62 |
| Milling | 963,162 | 4.37 | 976,362 | 4.49 |
| Marketing expense | 58,988 | 0.27 | 60,322 | 0.28 |
| Royalty under Ontario Mining Tax Act | — | — | 3,495 | 0.02 |
| Municipal and provincial taxes and lease rentals | 47,336 | 0.21 | 44,881 | 0.21 |
| Depreciation | 225,589 | 1.02 | 204,781 | 0.94 |
| Total | \$7,816,110 | \$35.42 | \$7,623,139 | \$35.04 |

ORE RESERVES

| | 1961 | | 1960 | |
|---------------------------------|------------------|----------------|------------------|----------------|
| | Tons | Ounces of Gold | Tons | Ounces of Gold |
| Estimated in place | 1,700,115 | 540,212 | 1,958,385 | 631,022 |
| Broken ore | 51,629 | 12,901 | 50,886 | 13,033 |
| Total | 1,751,744 | 553,113 | 2,009,271 | 644,055 |
| Average grade per ton | — | 0.316 | — | 0.321 |

The average number of employees was 1,198: 792 underground, and 406 on surface. P. B. McCrodan was mine manager.

McKenzie Red Lake Gold Mines Limited

McKenzie Red Lake Gold Mines Limited was incorporated in February 1933, with an authorized capitalization of 3,000,000 shares of \$1 par value. In 1956 the capitalization was increased to 5,000,000 shares of \$1 par value, of which 4,352,623 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, P. K. Hanley, 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 twelve claims at the north end of McKenzie Island in Red Lake, Dome township, District of Kenora (Patricia Portion).

Mining and milling operations continued throughout 1961.

SHAFTS, MCKENZIE RED LAKE MINE

| | Claim No. | Inclination | Number of Compartments | Total Depth from Surface |
|--|-----------|-------------|------------------------|--------------------------|
| No. 1 shaft (abandoned) | K.R.L.87 | Vertical | 3 | feet 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 | 1,817 |

No. 5 shaft was sunk a slope distance of 248 feet in 1961, to a vertical depth of 1,817 feet below the collar. The 1,800-foot level was established. Development work consisted of 1,878 feet of drifting; and 3,687 feet of raising. Total development footage to 31 December 1961 was as follows: 94,793 feet of drifts; 28,078 feet of crosscuts; 56,140 feet of raises. Diamond-drilling in 1961 consisted of 103 holes, totalling 10,149 feet, from underground.

The following is taken from the mine manager's report for the year ending 31 December 1961:

Exploration

Exploratory drilling below the mine's deepest North mine level has shown that the vein-dike structure continues strongly with depth. Cut grade for the first 185 feet of slope length below the 1,600-foot level was 0.540 ounce across an average width of 4.3 feet.

Mine Development

Initially, exploration and development will be directed towards opening the north mine, where the main shear structure is close to the 1,800-foot station and about 300 feet from the 1,950-foot station. The long drives to the South mine will be deferred until development results in the North mine have been determined.

Ore Position

Development results in the North mine, on the 1,800- and 1,950-foot levels, will determine the future of the mine. On each new level there is a minimum potential length of 1,200 feet along the North mine structure to develop. In addition, there is 600 feet along its slope length.

There is about one year's ore remaining above the 1,600-foot level.

Milling

Emphasis was placed on sorting during the year with the result that 16,859 tons of waste was sorted compared with 13,227 tons in 1960. Sorting increased the grade of hoisted ore by \$1.91 per ton of ore milled. Sorting costs were 0.25 cents per ton of ore milled.

The average number of employees was 109: 69 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 1., The mine address is Geraldton.

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

Mining and milling continued throughout 1961.

SHAFTS, MACLEOD-COCKSHUTT MINE

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

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Development work during the year consisted of 822 feet of drifting, 122 feet of crosscutting, and 377 feet of raising. Total development footage to 31 December 1961 was as follows: 105,331 feet of drifts; 28,769 feet of crosscuts; 34,743 feet of raises. Diamond-drilling in 1961 consisted of 75 holes, totalling 11,024 feet, from underground.

New equipment added in 1961 included the following:

- 1 tilt-deck trailer (Lacrosse, 8-ton).
- 2 slushers (Sullivan, B212).
- 2 motors (Westinghouse, 25 hp.).
- 4 12-man cars for transporting men underground.
- 18 mine cars (30 cu. ft.).
- 2 scrapers haulers (Joy C.F. 211) with one motor (Canadian General Electric, 50 hp.).
- 2 tuggers (Pekrose No. 6, Peacock Bros. Ltd.).

The following is taken from the general manager's report for the year ending 31 December 1961:

During 1961 the mine produced 72,004.503 ounces of gold and 6,939.19 ounces of silver from 696,064 tons of ore, averaging 0.103 ounce of gold recovered per ton.

Production was derived from the F zone, and at the year's end there was an estimated recoverable reserve of 579,000 tons, averaging 0.110 ounce per ton. There is also a small ore zone indicated on the porphyry contact on the 5th and 6th levels, which will be developed in 1962.

McLeod's decreasing reserves were not sufficient to maintain the mill at full capacity beyond the year's end, and in January 1962, Consolidated Mosher will be brought into production. Mosher's production in 1962 is planned to average 1,250 tons per day, and the remaining mill capacity of 650 tons per day will be supplied from MacLeod-Cockshutt.

Operating costs during the year were as follows:

| Distribution | In Full | Per Ton |
|---|-------------|----------|
| Mine development..... | \$ 24,427 | \$0.0351 |
| Mining..... | 1,109,797 | 1.5944 |
| Milling..... | 571,810 | 0.8215 |
| Marketing expense..... | 21,158 | 0.0304 |
| General expense at property..... | 229,120 | 0.3291 |
| Mine office and supervision..... | 79,818 | 0.1147 |
| Administration and corporation expense..... | 64,866 | 0.0932 |
| Ontario royalty tax..... | 25,500 | 0.0366 |
| Total..... | \$2,126,496 | \$3.0550 |

The average number of employees for the MacLeod and Consolidated Mosher operations was 336: 156 underground, and 180 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 1961 was 3,499,528. The directors and officers were: Joseph McDonough, president and director; F. R. Marshall, vice-president and director; Margaret Masterson, secretary-treasurer and director; Marius Madsen, H. H. Mackay, H. G. Young, and S. J. Bird, directors. The head office is at 55 Yonge Street, Toronto 1. The mine address is Madsen.

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

Mining and milling operations continued throughout 1961.

SHAFTS, MADSEN RED LAKE GOLD MINE

| | Claim No. | Inclination | Number of Compartments | Depth from Surface |
|----------------------------------|-------------|-------------|------------------------|--------------------|
| No. 1 shaft ⁽¹⁾ | K.R.L.11505 | Vertical | 2 | feet 573 |
| No. 2 shaft..... | K.R.L.12528 | Vertical | 5 | 3,875 |

⁽¹⁾Not being used.

Development work in 1961 consisted of 11,785 feet of drifting; 1,040 feet of crosscutting; and 3,138 feet of raising. Total development footage to 31 December 1961 was as follows: 136,927 feet of drifts; 23,608 feet of crosscuts; 53,743 feet of raises. Diamond-drilling in 1961 consisted of 556 holes, totalling 137,516 feet, from underground.

New equipment added included the following:

- 2 diesel locomotives (48 DLU, Ruston-Hornsby).
- 1 slusher (Pickrose S2A).
- 2 fans (Airfoil 19 J2 TK).
- 1 transformer (Canadian Westinghouse, 300 kva.).

The following is taken from the general manager's report for the year ending 31 December 1961:

Ore Reserve

The calculated ore reserve was as follows:

| Block | 31 December 1961 | | | 31 December 1960 | | |
|---------------------------|------------------|---------|-------|------------------|---------|-------|
| | Tonnage | Ounces | Grade | Tonnage | Ounces | Grade |
| 7th level to surface..... | 5,600 | 1,587 | 0.283 | 22,990 | 6,189 | 0.269 |
| 11th to 7th level..... | 32,440 | 8,988 | 0.277 | 52,160 | 15,205 | 0.291 |
| 17th to 11th level..... | 182,090 | 55,495 | 0.305 | 271,630 | 85,897 | 0.316 |
| 21st to 17th level..... | 363,750 | 131,390 | 0.361 | 206,000 | 80,898 | 0.393 |
| Broken reserve..... | 82,980 | 22,570 | 0.272 | 98,150 | 26,664 | 0.290 |
| Total..... | 666,860 | 220,030 | 0.330 | 650,930 | 214,853 | 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.

Production

| | 1961 | 1960 |
|------------------------|-------------|-------------|
| Milled..... tons | 301,031 | 306,377 |
| Gold produced..... oz. | 106,096.338 | 119,083.749 |

The total charge for stoping is reduced because of the tonnage of ore sent to the mill from stoping preparation work. This reduced the number of tons of ore that had to be broken in the stopes and consequently the costs charged to stoping.

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OPERATING COSTS

| Distribution | 1961 | | | 1960 | | |
|--|----------------|---------------------|-------------------------|----------------|---------------------|-------------------------|
| | In Full | Cost per Ton Milled | Cost per Ounce Produced | In Full | Cost per Ton Milled | Cost per Ounce Produced |
| Development and exploration..... | \$ 638,382.95 | \$ 2.121 | \$ 6.017 | \$ 650,867.27 | \$ 2.124 | \$ 5.465 |
| Stope preparation..... | 214,319.98 | 0.712 | 2.020 | 102,666.79 | 0.335 | 0.862 |
| Stoping..... | 890,642.95 | 2.959 | 8.394 | 976,311.43 | 3.187 | 8.199 |
| Mucking, tramping, and hoisting..... | 589,081.03 | 1.957 | 5.552 | 571,027.21 | 1.864 | 4.796 |
| Crushing and conveying..... | 93,895.30 | 0.311 | 0.885 | 99,121.69 | 0.324 | 0.832 |
| Milling..... | 336,652.43 | 1.118 | 3.173 | 373,202.41 | 1.218 | 3.134 |
| Mine general expense..... | 224,654.46 | 0.746 | 2.117 | 339,724.13 | 1.109 | 2.852 |
| Employee benefits..... | 316,507.38 | 1.052 | 2.984 | | | |
| Head office expense..... | 66,520.02 | 0.221 | 0.627 | | | |
| Marketing charges..... | 30,413.05 | 0.101 | 0.287 | | | |
| Total..... | \$3,401,069.55 | \$11.298 | \$32.056 | \$3,210,400.66 | \$10.479 | \$26.959 |
| Deduct estimate of emergency assistance..... | 590,000.00 | 1.960 | 5.561 | 140,000.00 | 0.457 | 1.176 |
| Net Total..... | \$2,811,069.55 | \$ 9.338 | \$26.495 | \$3,070,400.66 | \$10.022 | \$25.783 |

Milling

The details of the mill operation are shown in the following summary. For comparison the details of the two previous years' operations are also shown.

| | 1959 | 1960 | 1961 |
|---|---------|---------|---------|
| Treated dry tons | 301,999 | 306,377 | 301,031 |
| Operating time percent | 97.42 | 98.04 | 97.58 |
| Treated per calendar day tons | 827.4 | 837.09 | 824.74 |
| Average gold assay heads oz. | 0.4190 | 0.4092 | 0.3775 |
| Average gold assay tails oz. | 0.0256 | 0.02505 | 0.02502 |
| Recovery percent | 93.90 | 93.95 | 93.37 |

The tonnage of ore milled was lower than last year, owing to an increase in the amount of down time occurring and to the reduced capacity of the mills when the liners in all four mills were replaced.

Summary

The loss in production in the year, due to milling a smaller tonnage of lower grade ore, was in a good part offset by the higher price received per ounce of gold sold to the Royal Canadian Mint, and to the large increase in estimated payments received under the *Emergency Gold Mining Assistance Act*.

The tonnage of new ore located was 15,930 tons greater than the tonnage milled. This increased the total ore reserve to 666,860 tons. The grade of the ore reserve was maintained at 0.330 ounce per ton.

The average number of employees was 426: 265 underground, and 161 on surface. E. G. Crayston was general manager.

Mirado Nickel Mines Limited

Mirado Nickel Mines Limited was incorporated in April 1956, with an authorized capitalization of 4,000,000 shares of \$1 par value, of which 2,730,005 shares have been issued. The directors and officers were: J. R. Strathy, president and director; T. A. Richardson, vice-president and director; H. A. Oaks, director; B. N. Apple, secretary; W. H. Morrison, treasurer. The head office and mine address is 68 Yonge Street, Toronto 1.

The property consists of nine claims located in McElroy and Catharine townships, District of Timiskaming. It was formerly known as Yama Gold Mine Limited and Cathroy Larder Mines Limited. A vertical, three-compartment shaft had been sunk to a depth of 528 feet on claim L.26272 in McElroy township. A total of 7,343 feet of drifting, 4,351 feet of crosscutting, and 995 feet of raising had been completed by former operators on the 125-, 250-, 375-, and 500-foot levels.

Operations proceeded from 21 March to 15 November, 1961.

The shaft was dewatered, and an examination of the four levels was carried out. Some 70 feet of surface trenching averaging 2.5 feet in depth was completed. A total of 85 diamond-drillholes, totalling 14,844 feet, were completed from underground and 10 holes, totalling 4,698 feet, from surface. Four temporary buildings, partially prefabricated, were constructed.

The average number of employees was 7: 3 underground, and 4 on surface. J. M. Baker, geologist, was in charge of operations.

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;

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R. V. Porritt, vice-president and director; J. R. Timmins, L. H. Timmins, J. Y. Murdoch, K. C. Gray, and W. S. Row directors; C. H. Windeler, secretary; R. G. Rudolf, treasurer; R. Horsfall, assistant secretary; E. K. Cork, assistant treasurer; A. H. Zimmerman, comptroller. The executive office is at 1700 Bank of Nova Scotia Building, Toronto. The head office and mine office are at Pamour.

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

Mining and milling continued throughout 1961.

SHAFTS, PAMOUR MINE

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

Development work during the year consisted of 5,194 feet of drifting, 3,388 feet of crosscutting, and 5,615 feet of raising. Total corrected development footage to 31 December 1961 was as follows: 160,664 feet of drifts; 37,786 feet of crosscuts; 106,211 feet of raises. Diamond-drilling in 1961 consisted of 386 holes, totalling 62,092 feet, from underground and 3 holes, totalling 2,215 feet, from surface.

New equipment installed included a tailings pump (5-in. Linatex with 25-hp. motor) and a liquid cyanide tank (8,000-gal. capacity) in the mill.

The following is taken from the manager's report for the year ending 31 December 1961:

Ore Reserves

| | Total | Grade |
|---------------------------------|------------------|--------------|
| | tons | oz. per ton |
| BROKEN ORE | | |
| East end | 597,700 | 0.087 |
| West end | 222,800 | 0.098 |
| Total Broken Ore | 820,500 | 0.090 |
| ORE IN PLACE | | |
| East end | 556,600 | 0.107 |
| West end | 260,300 | 0.135 |
| Total Ore in Place | 816,900 | 0.116 |
| Total east-end ore | 1,154,300 | 0.097 |
| Total west-end ore | 483,100 | 0.118 |
| Total Ore | 1,637,400 | 0.103 |

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

After milling 647,618 tons, total ore reserves were maintained at about the same tonnage and grade as at the end of the previous year.

Development

Lateral development consisted of 3,100 feet in lava exploration, 1,775 feet in east greywacke, 1,158 feet in west greywacke, and 492 feet in conglomerate.

In the east end of the mine, 790 feet of drifting was in ore with an average grade of 0.091 ounce of gold per ton over drift width. In the west end of the mine, 552 feet of drifting was in ore with an average grade of 0.123 ounce of gold per ton over drift width.

Stoping

Stoping was carried on in both the east and west sections of the mine. Some 26 percent of the ore produced was from lava stopes. The east end provided 60 percent of the tonnage broken and 69 percent of the tonnage milled.

Cut-and-fill stopes provided 8 percent of the ore broken, slusher stopes 15 percent, blast-hole stopes 4 percent, and shrinkage stopes the remainder.

Mill

The average daily tonnage milled was 1,774, the average grade was 0.102 ounce per ton. Total mill recovery was 90.55 percent.

The average number of employees was 363: 197 underground, and 166 on surface. W. J. Marshall was mine manager.

Paymaster Consolidated Mines Limited

Paymaster Consolidated Mines Limited was incorporated in February 1930, with an authorized capitalization of 9,000,000 shares of \$1 par value, of which 8,629,090 shares have been issued. The directors and officers were: 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, consisting of 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 1961.

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 (filled) | P.14114 | Vertical | — | 75 |
| No. 8 shaft (filled) | P.14115 | Vertical | — | 185 |
| No. 9 shaft (ventilation) | P.14115 | Vertical | 1 | 185 |

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Development work during the year consisted of 2,935 feet of drifting, 810 feet of crosscutting, and 2,095 feet of raising. Total development footage to 31 December 1961 was as follows: 182,214 feet of drifts; 78,828 feet of crosscuts 60,279 feet of raises. Diamond-drilling in 1961 consisted of 200 holes from underground, totalling 26,028 feet.

The following is taken from the general manager's report for the year ending 30 June 1961:

Mining

New ore developed during the fiscal year totalled 1,549 feet, having an average width of 86 inches and an average cut grade of 0.27 ounce per ton.

Stoping operations were carried out from No. 5 winze levels between the 2,075- and 4,075-foot levels on the Nos. 8, 18, 24, and 31 veins; from No. 5 shaft, levels between the 3,750- and 4,075-foot levels on the Nos. 36 and 37 veins, and from No. 6 winze levels on the No. 36 vein.

Sources of ore during the fiscal year were as follows: development 6.8 percent, No. 5 winze levels 54.9 percent, No. 5 shaft levels 29.4 percent, and No. 6 winze levels 8.9 percent.

Ore Reserves

| Ore | Total | Grade |
|----------------|---------|-------------|
| | tons | oz. per ton |
| Probable | 47,753 | 0.228 |
| Positive | 331,801 | 0.235 |
| Broken | 11,873 | 0.243 |
| Total | 391,427 | 0.234 |

Ore reserves show a decrease of 13,452 tons, as compared with 30 June 1960, and the over-all grade remains the same.

Milling

During the fiscal year, 187,243.2 tons of ore were milled. The average milling rate was 513.0 tons per calendar day, as compared with 573.7 tons per calendar day in the previous year. Essential major repairs to the main fill-pass system in the mine reduced production over a three-month period and was the main reason for the drop in tons milled compared with the previous year.

Costs

| | Total Cost | Cost per Ton Milled |
|---------------------------------------|----------------|---------------------|
| Diamond-drilling | \$ 22,080.40 | \$0.12 |
| Drifting | 87,148.37 | 0.47 |
| Crosscutting | 8,557.89 | 0.05 |
| Raising | 43,611.91 | 0.23 |
| Special underground exploration | 45,000.29 | 0.24 |
| Mining | 1,109,041.20 | 5.92 |
| Ore transportation | 18,126.23 | 0.10 |
| Crushing | 50,117.28 | 0.27 |
| Milling | 272,216.21 | 1.45 |
| General expense | 150,364.87 | 0.80 |
| Total | \$1,806,264.65 | \$9.65 |

Outside Explorations

The company's exploration department carried out an active program during the year. Paymaster, in conjunction with Empire Gold Mines Limited and Consolidated Gillies Lake Mines Limited, held controlling interest in 191 mining claims. Although several claims, which were found to be of no economic value, were dropped, the total number of claim holdings was increased as compared with the previous fiscal year.

In the McArthur-Bartlett townships area, where the company has extensive claim holdings, a program of geophysical and geological surveying and diamond-drilling carried out over the past few years has not proved any orebodies of economic interest, and further work here has been held in abeyance.

In the greenstone belt lying in the western part of the Porcupine area, several claims were staked on the strength of a geophysical reconnaissance by the exploration staff. Further work has yet to be done to determine their worth.

The building-stone industry has indicated considerable interest in the ornamental stone deposit they hold in Bannockburn township, which encourages the prospect of realizing a profit from this property.

During the fiscal year, geophysical surveys were carried out over the properties owned by Paymaster and associated companies, in Tisdale, Deloro, Whitney, and Cody townships. These surveys confirmed some known geological structures, but nothing new was found.

The average number of employees was 294: 205 underground, and 89 on surface. L. K. Walkom was general manager.

Pick Mines Limited

Pick Mines Limited was incorporated in July 1959, with an authorized capitalization of 5,000,000 shares of \$1 par value, of which 2,198,852 shares have been issued. The directors and officers were: Royden Cowan, president and director; H. D. Baker, H. M. Howell, and George Sherman, directors; E. McLean, secretary. The head office address is 100 Adelaide Street West, Toronto 1. The mine address is Lochalsh.

The company has acquired the Cline and Pick groups of 16 claims, consisting of about 693 acres in Township 48, District of Algoma, about 12 miles east of Goudreau. The property, a gold-silver prospect, operated intermittently from 1913 until 1942. Cline Lake Gold Mines Limited operated the property in 1942.¹

Operations continued from 1 January until 30 April, 1961.

The installation of used milling equipment, commenced in 1960, was completed and test run. A limited amount of development work was done at the old No. 3 shaft area where a hoist and compressor were installed. Four diamond-drillholes, totalling 1,037 feet, were completed from surface.

M. C. Halstead, consultant, directed operations at the property.

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 3,554,744 shares have been issued. The directors and officers were: N. B. Keevil, president and director; C. G. MacIntosh, vice-president and director; R. M. Butler, secretary and director; J. C. Perry and J. H. Westell, directors; J. M. Bland, treasurer. The head office is at 11 Adelaide Street West, Toronto 1. The mine office is at Pickle Crow.

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

Mining and milling continued throughout 1961.

¹For a report on the property, see Ontario Department of Mines Vol. LII, 1943, pt. 1, p. 90.

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SHAFTS, PICKLE CROW MINE

| | Claim No. | Inclination | Number of Compartments | Total Depth from Surface |
|---|-----------|-------------|---|--------------------------|
| | | | | feet |
| No. 1 main shaft (Howell vein)..... | P.A.747 | Vertical | 3 to 1,200 feet 4 from 1,200 to 2,450 feet 3 from 2,450 to bottom | 3,042 |
| No 2 winze (below 750-foot level) (inactive)..... | — | Vertical | 3 | 1,547 |
| No. 3 shaft (5,000 feet N.E. No. 1)..... | P.A.2062 | Vertical | 3 to 1,554 feet 4 from 1,554 to 2,600 feet 3 from 2,600 to bottom | 3,031 |
| No. 4 winze (below 2,900-foot level).... | — | Vertical | 3 | 3,143 |

No. 4 winze was collared on the 2,900-foot level and had been sunk 243 feet at the year's end to a depth of 3,143 feet below surface. Development work during the year consisted of 2,932 feet of drifting, 1,061 feet of crosscutting, and 2,733 feet of raising. Total development footage to 31 December 1961 was as follows: 68,126 feet of drifts; 50,823 feet of crosscuts; 40,918 feet of raises. Diamond-drilling in 1961 included 110 holes, totalling 25,539 feet, from underground.

The following is taken from the mine manager's report for the year ending 31 December 1961:

Stoping

Some 125,086 tons of ore were hoisted to the crushing plant, of which 114,079 or 91.2 percent came from stopes; the remainder came from development. The distribution of the ore hoisted, by shafts and veins, was as follows:

| Veins | Ore | Grade |
|--------------------|--------|---------|
| | tons | percent |
| No. 1 SHAFT | | |
| No. 1..... | 8,314 | 6.64 |
| No. 5..... | 28,154 | 22.51 |
| No. 9..... | 24,727 | 19.77 |
| No. 12..... | 650 | 0.52 |
| No. 3 SHAFT | | |
| No. 2..... | 32,161 | 25.71 |
| No. 6..... | 19,125 | 15.29 |
| No. 7..... | 9,328 | 7.46 |
| No. 8..... | 778 | 0.62 |
| No. 13..... | 1,849 | 1.48 |

Production

| | 1961 | 1960 |
|---------------------------------|---------|---------|
| Milled..... tons | 124,821 | 120,345 |
| Gold recovered..... oz. | 48,447 | 39,663 |
| Silver recovered..... oz. | 5,000 | 5,067 |
| Gold recovered per ton..... oz. | 0.3881 | 0.3296 |
| Recovery..... percent | 98.98 | 98.74 |

Costs

A comparative analysis of operating costs for the last two years follows:

| | In Full | | Per Ton Ore Treated | | Per Ounce Gold Recovered | |
|--------------------------------|-------------|-------------|------------------------|---------|-----------------------------|---------|
| | 1961 | 1960 | 1961 | 1960 | 1961 | 1960 |
| Development..... | \$ 203,547 | \$ 245,017 | \$ 1.63 | \$ 2.04 | \$ 4.20 | \$ 6.18 |
| Mining..... | 896,616 | 930,834 | 7.18 | 7.73 | 18.51 | 23.47 |
| Milling..... | 234,185 | 218,581 | 1.88 | 1.82 | 4.83 | 5.51 |
| General mine expense..... | 202,346 | 189,151 | 1.62 | 1.57 | 4.18 | 4.77 |
| Administrative expense..... | 46,829 | 54,618 | 0.37 | 0.45 | 0.97 | 1.37 |
| Total..... | \$1,583,523 | \$1,638,201 | \$12.68 | \$13.61 | \$32.69 | \$41.30 |

Ore Reserves

| | Ore Reserves | Grade (Gold at \$35 per oz.) |
|---------------------|-----------------|------------------------------------|
| 1 January 1962..... | tons 323,105 | \$13.11 |
| 1 January 1961..... | 407,803 | \$13.03 |

The decrease in reserves is due to development in the past year being primarily concentrated on preparations for shaft sinking to open six new levels below the 2,900-foot level.

No ore below the bottom levels is included in the above reserves. However, diamond-drilling has indicated ore conditions similar to those encountered on the present bottom level, and on this basis the six new levels are estimated to contain more than 300,000 tons of ore grading better than \$14 in the No. 1, No. 5, and No. 9 veins.

The average number of employees was 239: 143 underground, and 96 on surface. A. E. Cave was mine manager.

Preston Mines Limited

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

The property consisting of eighteen claims, immediately south and east of the Dome mine, is located in Tisdale and Deloro townships, Porcupine area,

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District of Cochrane. Early in 1959 the company acquired the property of Midcamp Mines Limited, consisting of 355 acres, adjoining the Paymaster and Preston mines.

Mining and milling operations continued throughout 1961.

SHAFTS, PRESTON MINE

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

Development work during the year consisted of 2,665 feet of drifting; 3,220 feet of crosscutting; and 2,883 feet of raising. The total development footage figures have been increased to include the work completed on the Midcamp property prior to 1959. The corrected totals at 31 December 1961 were as follows: 119,164 feet of drifts; 154,472 feet of crosscuts; 61,630 feet of raises. Diamond-drilling in 1961 consisted of 450 holes, totalling 59,849 feet, from underground.

The following is taken from the mine manager's report for the year ending 31 December 1961:

Operating Costs

Operating costs per ton milled before providing for depreciation, administration costs, taxes, and write-offs were as follows:

| | |
|---------------------------------------|--------|
| Development and diamond-drilling..... | \$1.85 |
| Mining..... | 5.52 |
| Milling..... | 1.19 |
| | \$8.56 |

Development

The total ore developed in 1961 was 1,459 feet, of which 1,399 feet was in the Midcamp zone. The average width was 4.6 feet and average grade 0.21 ounce of gold per ton.

The mine produced 214,580 tons of ore during the year, of which 8.1 percent came from development. At the year's end, the broken-ore reserves were 33,900 tons, a decrease of 13,500 tons.

Development of the Midcamp greenstones is proceeding satisfactorily. The zones are characterized by an absence of visual limits to the economic values, and the necessity of stopping to assay boundaries makes grade control and grade projection difficult. To date, most of the ore removed has been from development and stope preparation, and a grade of 0.20 ounce is anticipated.

Ore Reserves

Ore reserves at 31 December 1961 totalled 546,412 tons averaging 0.23 ounce of gold per ton, uncut, and 0.21 ounce per ton, cut grade. This is a decrease of 21,000 tons as compared with 1960.

In computing reserves in Midcamp, projected volumes for ore have been conservatively calculated. Variations in the zones have dictated this policy. Below the 18th level, only 25,000 tons have been included in reserves, owing to incomplete development.

General

The mill performed normally throughout the year with an average recovery of 97.6 percent. Capital expenditures totalled \$23,287 for the year, covering the cost of extension to the hydraulic-fill plant, and one 1961 Ford truck. On the 2nd level a fill-storage tank of about 1,200 tons capacity was excavated and equipped and is now ready for use.

The use of ammonium nitrate for blasting was begun in September 1961, and it is now used throughout the mine.

The average number of employees was 316: 227 underground, and 89 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; J. D. Bryce, executive vice-president and director; G. A. Howes, J. C. L. Allen, J. G. Boeckh, Larmour Soliaque, and C. C. Huston, directors; H. W. Salthouse, secretary-treasurer. The head office is at 85 Richmond Street West, Toronto 1., The mine address is Renabie.

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

Mining and milling continued throughout 1961.

SHAFTS, RENABIE MINE

| | Claim No. | Inclination | Number of Compartments | Total Depth from Surface |
|-----------------------|--------------------------|-------------|------------------------|--------------------------|
| No. 1 shaft | S.34314 (Leeson twp.) | Vertical | 3 | feet 281 |
| No. 2 shaft | S.34317 (Leeson twp.) | Vertical | 3 | 2,511 |

No. 2 shaft was sunk 282 feet in 1961 to a depth of 2,511 feet below the collar. The 2,325- and 2,475-foot levels were established at depths of 2,331 and 2,481 feet. Development work during the year consisted of 3,943 feet of drifting 1,409 feet of crosscutting, and 1,763 feet of raising. Total development footage to 31 December 1961 was as follows: 31,036 feet of drifts; 14,797 feet of crosscuts; 18,629 feet of raises. Diamond-drilling in 1961 consisted of 144 holes, totalling 26,022 feet, from underground.

New construction in 1961 included additions to the cookery (32 x 35 ft. and 16 x 27 ft.), a residence (33 x 24 ft.), an addition to the mill for a water treatment plant (14 x 14 ft.), an addition to the recreation club (40 x 13 ft.), all frame constructed.

New equipment added was as follows:

WATER TREATMENT PLANT:

- 1 pressure filter (60-in. diam. by 5 ft., type F, Permutit).
- 1 pressure alum feeder (Permutit).
- 1 chlorinator (manual V notch, Wallace and Tiernan).

SURFACE HOIST:

Changed to dual drive by addition of one motor (250-hp., 600-rpm.), 20 resistors, current transformer and secondary panel (Can. Gen. Electric), pinion shaft, pillow blocks etc. (John Bertram and Son Ltd.).

UNDERGROUND:

- 1 rocker shovel (model 21-55, Eimco).
- 3 sinking buckets (30 cu. ft., Wabi Iron Works).
- 1 sinking crosshead (Keely type, Wabi Iron Works).
- 1 fan (two-stage, contra-rotating, axial-flow, 1,750 rpm. 19 B, Type 86, Sheldon Engineering).
- 1 fan (Vaneaxial, 16 B Type 1312, with 5-hp. motor, Sheldon Engineering).

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The following is taken from the mine manager's report for the year ending 31 December 1961:

Milling

The average tons milled per day in 1961 was 548.5, as compared with 490.5 in 1960. Bullion recovery consisted of 37,934.492 ounces of gold and 10,970.85 ounces of silver.

The over-all milling costs for the year decreased to \$1.56 per ton from \$1.73 per ton in 1960. The recovery was 94.1 percent as compared with 94.9 percent in 1960.

Ore Reserves

The technical position of ore reserves at the year's end, after allowing for dilution, elimination of any doubtful or marginal ore, and not including any ore below the 1,850-foot level, was as follows:

| Source | Ore | Grade | Value (gold at \$35 per ounce) |
|-------------------|-----------------|----------------------|--------------------------------------|
| Unbroken ore..... | tons 233,498 | oz. per ton 0.215 | \$7.53 |
| Broken ore..... | 88,956 | 0.231 | 8.09 |
| Total..... | 322,454 | 0.219 | \$7.67 |

Operating Costs

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

| Distribution | 1961 | | 1960 | |
|---|---|-----------|---|-----------|
| | 37,934.492 ounces recovered from 200,215 tons milled | | 38,911.290 ounces recovered from 179,520 tons milled | |
| | per ton | per ounce | per ton | per ounce |
| Development and exploration..... | \$1.70 | \$ 8.98 | \$1.88 | \$ 8.69 |
| Mining..... | 2.81 | 14.85 | 3.08 | 14.20 |
| Milling..... | 1.56 | 8.21 | 1.73 | 7.97 |
| Undistributed operating charges including administration and head office..... | 0.50 | 2.65 | 0.56 | 2.60 |
| Operating costs..... | 6.57 | 34.69 | 7.25 | 33.46 |
| Depreciation..... | 0.51 | 2.68 | 0.55 | 2.53 |
| Provisions for municipal, federal and provincial taxes..... | 0.03 | 0.15 | 0.04 | 0.18 |
| Total Costs..... | \$7.11 | \$37.52 | \$7.84 | \$36.17 |

The average number of employees was 189: 90 underground, and 99 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, reduced in 1960 to \$0.35 par value by a distribution of \$0.65 per share. There were 3,299,500 shares issued. The directors and officers were: W. V. Moot, president and managing director; K. C. Gray and Whitworth Ferguson, vice-presidents and directors; W. S. Walton, secretary-treasurer and director; W. L. Marcy, L. S. Sheriff, and A. F. Osborn, directors. The head office and mine address is Box 670, Kirkland Lake.

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

Hoisting of ore proceeded from 1 January to 11 August; salvage work underground, to 25 October; all shafts were sealed by 30 October 1961. The mill operated from 1 January to 30 September, 1961.

SHAFTS, SYLVANITE MINE

| | Claim No. | Number of Compartments | Total Depth from Surface |
|--|-----------|------------------------|--------------------------|
| No. 1 shaft (inactive) | L.2226 | 2 | feet 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 |

The following table records the development footage completed in 1961 and the total accumulated footage at the time of closure:

| Level | Drifts | | Crosscuts | | Raises (Excluding boxholes) | |
|---------------|--------|-----------|-----------|----------|--------------------------------|----------|
| | 1961 | Total | 1961 | Total | 1961 | Total |
| 125-ft..... | — | 2,030.0 | — | 355.5 | — | 231.5 |
| 250-ft..... | — | 9,212.5 | — | 2,676.0 | — | 1,576.0 |
| 375-ft..... | — | 11,488.5 | — | 3,041.0 | — | 4,202.5 |
| 500-ft..... | — | 13,383.0 | — | 4,167.5 | — | 2,785.0 |
| 625-ft..... | — | 12,667.0 | — | 3,040.0 | — | 3,325.5 |
| 750-ft..... | — | 14,431.5 | — | 3,787.0 | — | 4,131.5 |
| 875-ft..... | — | 16,960.0 | — | 4,996.0 | — | 5,531.5 |
| 1,000-ft..... | — | 17,390.0 | — | 5,588.0 | 62.0 | 7,345.5 |
| 1,125-ft..... | — | 11,935.0 | — | 3,413.5 | — | 4,973.0 |
| 1,250-ft..... | — | 10,347.0 | — | 4,386.5 | — | 4,304.5 |
| 1,375-ft..... | — | 6,908.0 | — | 2,997.5 | — | 2,531.0 |
| 1,500-ft..... | — | 6,015.0 | — | 2,537.5 | — | 2,211.0 |
| 1,625-ft..... | — | 6,269.0 | — | 2,084.0 | — | 1,649.5 |
| 1,750-ft..... | — | 9,731.0 | — | 3,035.0 | — | 2,656.5 |
| 1,875-ft..... | — | 6,862.0 | — | 1,942.0 | — | 2,154.0 |
| 2,000-ft..... | — | 6,049.0 | — | 2,532.0 | — | 1,546.0 |
| 2,125-ft..... | — | 1,813.0 | — | 430.0 | — | 680.5 |
| 2,250-ft..... | — | 5,054.0 | — | 1,830.5 | — | 2,233.5 |
| 2,375-ft..... | — | 4,536.0 | — | 2,186.5 | — | 1,246.5 |
| 2,500-ft..... | — | 5,881.0 | — | 2,007.5 | — | 2,244.5 |
| 2,625-ft..... | — | 4,827.0 | — | 1,572.5 | — | 1,258.0 |
| 2,750-ft..... | — | 3,835.5 | — | 2,025.0 | — | 1,692.5 |
| 2,875-ft..... | — | 3,320.0 | — | 1,593.5 | — | 725.0 |
| 3,000-ft..... | — | 4,264.5 | — | 1,645.5 | — | 1,419.5 |
| 3,150-ft..... | — | 3,038.0 | — | 1,219.0 | — | 1,633.0 |
| 3,300-ft..... | — | — | — | 23.0 | — | 355.0 |
| 3,450-ft..... | — | 2,200.0 | — | 552.0 | — | 800.0 |
| 3,600-ft..... | — | 2,551.0 | — | 1,060.0 | — | 362.5 |
| 3,750-ft..... | — | 3,122.0 | — | 341.0 | — | 613.0 |
| 3,900-ft..... | — | 2,013.0 | — | 320.5 | — | 471.5 |
| 4,050-ft..... | — | 778.5 | — | — | — | 293.0 |
| 4,200-ft..... | — | 3,396.0 | — | 893.0 | — | 1,516.0 |
| 4,350-ft..... | — | 4,131.0 | — | 643.0 | 26.0 | 1,899.0 |
| 4,500-ft..... | — | 3,757.5 | — | 659.5 | — | 1,656.0 |
| 4,650-ft..... | — | 2,547.0 | — | 176.0 | 63.0 | 1,180.0 |
| 4,800-ft..... | — | 2,864.5 | — | 384.0 | — | 679.5 |
| 4,950-ft..... | — | 1,655.0 | — | 212.5 | — | 377.0 |
| 5,100-ft..... | — | 1,149.0 | — | 148.5 | — | 216.0 |
| 5,250-ft..... | — | 411.0 | — | — | — | — |
| 5,400-ft..... | — | 1,947.5 | — | 28.0 | — | — |
| 5,550-ft..... | — | 2,333.5 | — | 118.0 | — | 12.0 |
| Total | — | 233,104.0 | — | 70,648.0 | 151.0 | 74,718.0 |

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The following is taken from the manager's report for the year ending 31 December 1961:

Production

During the year, 102,109 tons were milled producing 28,310.000 ounces of gold and 6,929.05 ounces of silver with a value of \$1,003,351. The mill averaged 445.9 tons per day for the 7½ months in which it was in normal operation. The grinding units were shut down on 17 August. Clean-up operations in the mill continued until 30 September.

Underground Operations

The mining of the remaining orebodies was completed in July and produced 55,478 tons of ore. This tonnage, along with the 45,671 tons of the broken-ore reserves at the beginning of the year, was cleaned out of the mine and sent to the mill. The last ore was hoisted on 11 August.

On completion of mining operations, work was commenced on salvage of underground equipment and the building of bulkheads to control the diversion of mine water. This work was completed by 25 October. All surface openings were sealed by 31 October.

The average number of employees was 165: 100 underground, and 65 on surface. W. S. Maguire was manager.

Teck-Hughes Gold Mines Limited

Teck-Hughes Gold Mines Limited was incorporated in March 1923, with an authorized capitalization of 5,000,000 shares of \$1 par value, of which 4,862,144 have been issued. The officers and directors were: 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, G. L. Jennison, and D. A. Perigo, directors. The head office address is Woodstock. The executive office is at 11 Adelaide Street West, Toronto 1. The mine address is Kirkland Lake.

The Annual Report of the Ontario Department of Mines for 1960 stated that Teck-Hughes Gold Mines Limited acquired the adjoining Kirkland Minerals Corporation Limited property, which included eleven claims. With this addition the Teck-Hughes property now consists of forty-four claims in Teck township, Kirkland Lake area, District of Timiskaming. The shafts on the former Kirkland Minerals property are shown in the 1960 report of that company. The reported total development footage, consisting of 113,730 feet of drifts, 39,752 feet of crosscuts, and 26,065 feet of raises completed by Kirkland Minerals up to the time of mine closure, 27 August 1960, are transferred and included in Teck-Hughes totals in this report.

Mining and milling continued throughout 1961.

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 |

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

During the year, 2,284 feet of drifting, 942 feet of crosscutting, and 1,301 feet of raising was completed. Total development footage to the end of the year was as follows: 257,211 feet of drifts; 95,757 feet of crosscuts; 114,106 feet of raises. Some 132 diamond-drillholes, totalling 7,332 feet, were completed during 1961 from underground and 5 holes, totalling 420 feet, from surface. A total of 128,938 tons of ore was hoisted; the mill treated 141,190 tons, averaging 386.8 tons daily.

The following is taken from the manager's report for the year ending 30 September 1961:

Operating Costs

Operating costs increased by \$1.40 per ton, owing to greater expenditures for development and general expense, combined with a reduction in tonnage.

A comparison of operating costs for the fiscal year ended 30 September, with those of the previous year, follows:

| Distribution | In Full | | Per Ton of Ore Treated | | Per Ounce of Gold Produced | |
|---------------------------|----------------|----------------|------------------------|--------|----------------------------|----------|
| | 1961 | 1960 | 1961 | 1960 | 1961 | 1960 |
| Development | \$ 169,165.52 | \$ 117,614.97 | \$1.06 | \$0.62 | \$ 6.117 | \$ 4.005 |
| Mining | 643,477.52 | 654,505.47 | 4.04 | 3.44 | 23.269 | 22.287 |
| Milling | 252,704.05 | 271,369.75 | 1.59 | 1.43 | 9.138 | 9.240 |
| General expense | 99,165.88 | 82,852.60 | 0.63 | 0.43 | 3.586 | 2.821 |
| Depreciation | 679.63 | 291.22 | | | 0.025 | 0.010 |
| Totals | \$1,165,192.60 | \$1,126,634.01 | \$7.32 | \$5.92 | \$42.135 | \$38.363 |

Ore Reserves

Ore reserves at 30 September compared with those of the previous year as follows:

| Source | Ore Reserve | | Gold Content | | Average Grade | |
|---------------------------|-------------|---------|--------------|----------|---------------|-------------|
| | 1961 | 1960 | 1961 | 1960 | 1961 | 1960 |
| | tons | tons | ounces | ounces | oz. per ton | oz. per ton |
| POSITIVE ORE | | | | | | |
| Blocked | 58,632 | 60,001 | 22,872.0 | 21,524.0 | 0.390 | 0.359 |
| Broken | 28,378 | 43,802 | 5,777.1 | 8,700.1 | 0.203 | 0.198 |
| Total Positive | 87,010 | 103,803 | 28,649.1 | 30,224.1 | 0.330 | 0.291 |
| POTENTIAL ORE | | | | | | |
| Blocked | 4,493 | 7,778 | 1,998.7 | 3,609.7 | 0.445 | 0.464 |
| Broken | 9,830 | 9,830 | 3,966.6 | 3,966.6 | 0.403 | 0.403 |
| Total Potential | 14,323 | 17,608 | 5,965.3 | 7,576.3 | 0.416 | 0.430 |
| Totals | 101,333 | 121,411 | 34,614.4 | 37,800.4 | 0.341 | 0.311 |

The term potential ore as used here refers to proven ore in old workings, which may not be recoverable economically. Such ore is transferred to positive if and when its recovery becomes feasible.

A substantial part of the above reserve is tied up in areas that should not be disturbed by ore removal at the present time.

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Development

Development footage increased about 42 percent compared with the previous twelve-month period.

Much of the level development was in barren wallrock to by-pass abandoned or caved workings, particularly to gain access to the boundary pillar of the Kirkland Minerals property, the mining rights of which were acquired during the year.

New ore developed on levels totalled 98 feet averaging 0.52 ounce per ton over 6.2 feet as follows:

| | |
|--------------------------|------|
| | Feet |
| No. 34 level Q vein..... | 48 |
| No. 37 level R vein..... | 50 |

Ore and "low-grade" sent to the mill from drifting and crosscutting totalled 2,563 tons, compared with 1,451 tons the year before.

In addition to the small amount of ore developed on levels, there were more substantial footages developed in subdrifts and raises, while seeking extensions to known veins and structures.

Connections to Kirkland Minerals levels were made from Nos. 8, 20, 33, and 39 levels. Exploratory drifts or crosscuts were driven into their ground on Nos. 32, 34, and 40 levels. Exploration and development from these levels is in progress.

Mining

The sources of ore milled during the twelve months ending 30 September, as compared with the previous year, are shown below:

| Section | Total | | Gold Content | | Average Grade | |
|-------------------------|---------|---------|--------------|----------|---------------|-------------|
| | 1961 | 1960 | 1961 | 1960 | 1961 | 1960 |
| | tons | tons | ounces | ounces | oz. per ton | oz. per ton |
| Surface stockpile . . . | 9,594 | — | 2,184.5 | — | 0.228 | — |
| Levels 0-10 | 65 | — | 13.2 | — | 0.204 | — |
| Levels 10-20 | 42,567 | 70,018 | 10,284.7 | 14,802.2 | 0.241 | 0.212 |
| Levels 20-30 | 77,299 | 93,683 | 7,802.5 | 10,967.9 | 0.101 | 0.117 |
| Levels 30-40 | 29,630 | 26,514 | 8,770.8 | 5,300.1 | 0.296 | 0.200 |
| Levels 40-50 | — | — | — | — | — | — |
| Totals | 159,155 | 190,215 | 29,055.7 | 31,070.2 | 0.183 | 0.164 |

The amount of ore obtained from the branch veins in the hanging wall was 6.7 percent of the tonnage milled, containing 16.0 percent of the gold content, compared with 1.8 percent of the tonnage milled and 4.2 percent of the gold content during the corresponding period the previous year.

The substantial reduction in tonnages from levels Nos. 10-30 was due to the exhaustion of profitable slough in sections of the mine where it can be drawn at this time without undue disturbance to important workings or surface features.

Stoping has been continued in scattered orebodies, pillars, and remnants between Nos. 17 and 40 levels. The new branch vein on No. 19 level, reported last year for the first time, though narrow has been yielding a good grade of ore.

The R vein, formerly stoped between Nos. 34 and 36 levels, has been found and developed on No. 37 level where stoping has recently commenced.

In the former Kirkland Minerals ground, stoping has been, or is being conducted on Nos. 33, 34, 39, and 40 levels, and prospects are being developed on No. 20 level.

In view of declining reserves of low-grade slough, which have been supplying much of the mill feed, it has been necessary to reduce the milling rate. It is hoped, however, to make up the loss by improving the ore grade as more active stopes are developed and put into production.

The average number of employees was 194: 124 underground, and 70 on surface. G. G. Gilchrist was manager.

Thorncliffe Mines Limited

Thorncliffe Mines Limited was incorporated in September 1958, with an authorized capitalization of 2,000,000 shares of \$1.00 par value, later increased to 3,000,000 shares of no par value, of which 2,600,000 shares have been issued. The directors and officers were: J. H. Thompson, president and director; George

Schaefer, vice-president and director; W. C. Rauch, director; R. W. Davies, secretary; C. E. Upton, treasurer. The head office and mine address is Box 11, Timmins.

The property consists of twenty-four claims in Garrison township, District of Cochrane, leased from Buffonta Mines Limited. Operations progressed from 1 September to 15 December, 1961.

Timbering in the vertical, three-compartment No. 1 shaft, 111 feet in depth, located on claim No. 21753, was completed. Development work consisted of some 40 feet of crosscutting on the 100-foot level. A new 3½-mile access road running north from the mine connects with highway No. 101 at a point some 25 miles east of Matheson.

The existing buildings were renovated, and new construction included a machine-shop addition to the powerhouse, a change house, a refinery, an assay office, and a coal-fired heating plant. The plant from Tyrante Mines Limited was purchased and installed. Crushing in three stages is arranged to handle ore from the mine or from a nearby open pit. The addition of a second ball-mill late in the year will augment the flotation-continuous cyanidation plant to some 300 tons daily capacity. A small open pit just east of the mill was mined in two 10-foot faces using an airtrac drill, a mucker (Eimco 105), and a truck (15-ton Euclid) for haulage to the mill. The mill treated some 2,000 tons, averaging about 50 tons daily.

C. W. Miller was manager; 35 men were employed during the period of operation.

Thunderhead Gold Mines Limited

Thunderhead Gold Mines Limited was incorporated in December 1945 with an authorized capitalization of 3,000,000 shares at \$1 par value, of which 1,370,861 shares have been issued. The directors and officers were: Robert Campbell, president and director; J. A. Gillies, vice-president and director; T. R. Deacon, director; E. A. Benevides, secretary-treasurer. The head office is at 36 Yonge Street, Toronto 1.

The property, a gold prospect, consists of about 360 acres in lot 10, concession II, Gorham township, District of Thunder Bay. Operations progressed from 1 October to 31 December, 1961.

An adit, which will give 85-100 feet of backs, was driven a distance of 200 feet to explore No. 1 vein. Four diamond-drillholes, totalling 600 feet, were completed from surface. New construction consisted of a pump house (8 x 10 ft.) and a steel shop (10 x 15 ft.), both frame constructed.

The average number of employees was two; Robert Campbell was president and manager of the operation.

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 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; K. H. Larkin, secretary-treasurer and director; E. T. Donaldson and J. A. Dickson, directors. The head office is at 250 University Avenue, Toronto. The mine address is Dobie.

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

Mining and milling continued throughout 1961.

SHAFTS, UPPER CANADA MINE

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

During the year, 5,078 feet of drifting, 1,648 feet of crosscutting, and 3,446 feet of raising was completed. Total development footage to 31 December 1961 was as follows: 132,118 feet of drifts; 32,326 feet of crosscuts; 34,507 feet of raises. Some 386 diamond-drillholes, totalling 41,082 feet, were drilled from underground and 11 holes, totalling 8,175 feet, from surface. Surface trenching consisted of some 300 feet in length averaging 1 foot in depth.

The following is taken from the general manager's report for the year ending 31 December 1961:

Exploration and Development

The surface diamond-drilling program in the area north of No. 1 shaft disclosed some ore values, but did not indicate possible orebodies large enough to warrant underground exploration at that distance from the mine workings. The structure appears to be persistent and will be tested again at greater depth by deepening underground drillholes.

Completion of the underground hoisting plant on the 3,625-foot level permitted a considerable increase in development footages. A total of 1,985 feet of ore, grading \$11.71 over a width of 7.5 feet, was developed, mostly on the eight levels below the 3,625-foot level. The two new levels, the 4,675-foot and 4,825-foot, are now advancing in the ore zone with results comparable to the levels above. Ore-reserve grade above the 3,625-foot level is \$9.46 per ton. Ore developed to date below this horizon grades \$13.45. Both calculations are based on \$35.00 per ounce for gold. Over 2,000 feet of drifting is still required to complete the development above the 4,825-foot level.

Operating Costs and Profits

Cost per ounce of gold produced before depreciation, taxes, etc., was \$32.214. Operating costs per ton milled over the past four years are tabulated below:

| | 1961 | 1960 | 1959 | 1958 |
|--|--------|--------|--------|--------|
| Mine exploration and development | \$1.69 | \$1.41 | \$1.53 | \$1.24 |
| Mining | 5.13 | 4.71 | 5.02 | 4.85 |
| Milling | 1.43 | 1.25 | 1.26 | 1.27 |
| General expense | 1.07 | 0.96 | 0.99 | 0.94 |
| Total | \$9.32 | \$8.33 | \$8.80 | \$8.30 |

Main factors contributing to the rise in costs are the increase in development and stope preparation program, and a change from shrinkage to cut-and-fill stoping on the deeper levels.

New developments in blasting agents, currently being tested at the mine, promise appreciable savings in explosive costs.

The average price received for gold was \$35.538 per ounce in 1961 compared with \$34.001 in the previous year. This improvement in price and the greater number of ounces produced resulted in a substantial increase in operating and net profits.

Milling

Average tons milled per day was 562.8, recovery was 93.28 percent and tailings loss was \$0.74. The mill operated 98.9 percent of total possible running time. Additional recovery from the three new agitators increased to 20 cents per ton and is the principal reason for the improvement in extraction from 91.4 percent in 1960 to 93.28 percent in 1961.

Maintenance and repair costs were unusually high, as several major pieces of equipment in the mill and crushing plant were reconditioned. Milling costs are also higher, owing to increased consumption of lime and cyanide. Experimental work is now underway to determine if these costs can be lowered.

The average number of employees was 289: 175 underground, and 114 on surface. J. H. Botsford was general manager.

Upsala Mines Limited

Upsala Mines Limited was incorporated in October 1961, with an authorized capitalization of 100,000 shares of no par value; all shares have been issued. The directors and officers were: Robert Clutter, president and director; E. A. Glos, vice-president and director; Albert Clutter, M. J. Downes, G. B. Wayson, Stan White, and D. C. Woolley, directors; Miss J. J. Downes, treasurer; George Wisthoff, secretary. The head office is at 372 Bay Street, Toronto 1. The mine address is Box 980, Espanola.

The property, consisting of five claims, is a gold prospect, in Curtin township, District of Sudbury.

In late 1961 work commenced on the construction of a pilot mill and warehouse. The installation of plant equipment, including a compressor (600-cfm.) and diesel engines was planned.

E. A. Glos was in charge at the property; some 12 men were employed during the period of operation.

Vermont Mines Limited

Vermont Mines Limited was incorporated in October 1951, with an authorized capitalization of 3,000,000 shares of \$1 par value, of which 1,650,006 shares have been issued. The directors and officers were: K. A. Davis, president, manager, and director; R. A. Halet, vice-president and director; J. L. Noble, secretary-treasurer and director; J. A. Hackett, P. S. Broadhurst, and J. L. Pilon, directors; I. Armstrong, assistant secretary-treasurer. The head office is at suite 505, 80 Richmond Street West, Toronto 1.

The properties consist of forty-one claims located in Shakespeare township, District of Sudbury, and in Mickle, Farr, and Bucke townships, District of Timiskaming. A program of diamond-drilling, commencing in March, was carried out in the north adit level of the former Shakespeare gold mine in Shakespeare township. A vertical, two-compartment shaft, located in claim S.110445, had been sunk to a depth of 227 feet by former operators. Some 9 diamond-drillholes, totalling 1,487 feet, were completed from underground.

K. A. Davis, president, was in charge at the property; four men were employed during the period of operation.

Wright-Hargreaves Mines Limited

Wright-Hargreaves Mines Limited was incorporated in June 1916, with an authorized capitalization of 5,500,000 shares of \$1 par value, which were reduced to a par value of 40 cents in 1960: all shares have been issued. The

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directors and officers were: R. C. Stanley Jr., president and director; J. G. Boeckh, executive vice-president, treasurer, and director; J. C. L. Allen, S. J. Bird, 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, consisting of four claims, is in Teck township, Kirkland Lake area, District of Timiskaming.

Mining operations continued throughout 1961.

SHAFTS, WRIGHT-HARGREAVES MINE

| | Claim No. | Inclination | Number of Compartments | Total Depth from Surface |
|--|-----------|-------------|---------------------------------|--------------------------|
| | | | | feet |
| No. 1 shaft (ventilation)..... | L.1829 | Vertical | { 2 to 2,000 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 554 feet of drifting, 208 feet of crosscutting, and 1,381 feet of raising was completed. Total development footage to 31 December 1961 was as follows: 257,109 feet of drifts; 91,912 feet of crosscuts; and 79,365 feet of raises. Some 35 diamond-drillholes, totalling 7,898 feet, were drilled from underground and 6 holes, totalling 3,157 feet, from underground, under the Wright-Hargreaves-Sylvanite agreement.

New construction consisted of a concrete bulkhead on the 3,400-foot level to impound water draining from the Sylvanite mine, and a new 4-inch discharge line installed in No. 4 shaft to handle the increased flow of water. A new pump (Mather and Platt, HS Plurovane, 2/2½, 6-stage, 100-gpm. with 60-bhp. motor) was installed on the 700-foot level to handle water draining from the upper Sylvanite levels. This installation included a new 4-inch discharge line to surface.

The following is taken from the general manager's report for the year ending 31 December 1961:

Mining

Stopes were worked on 33 of the 51 main levels down to the 7,200-foot level and on all 6 of the new levels below the 7,200-foot level.

Of the total ore milled, 31,045 tons, or 19.5 percent of the total (18.1 percent in 1960), was obtained from mining and a small amount of development work on the six new levels opened from No. 6 winze.

The average gold content of ore milled in the year was 0.385 ounce per ton, compared with 0.394 in 1960 and 0.421 in 1959.

The broken-ore reserve was reduced by 7,575 tons to a total of 37,948 tons at the end of the year.

The following table shows the origin of ore hoisted in 1961:

| | From Stopes | From Development | Hoisting Stages |
|----------------------------------|-------------|------------------|-----------------|
| | tons | tons | |
| Surface to 3,900-foot level..... | 77,577 | 1,160 | 1 |
| 4,050- to 7,200-foot level..... | 48,207 | 1,089 | 2 |
| 7,350- to 8,100-foot level..... | 28,091 | 2,954 | 3 |
| Total..... | 153,875 | 5,203 | — |

Milling

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

Average daily milling rate was 435.8 tons, compared with 450.8 in 1960 and 466.4 tons in 1959.

Mill recovery of gold was 96.1 percent of the contained gold, compared with 96.3 percent in the previous year.

Ore Reserves

After milling 159,078 tons of ore in the year, the developed available unbroken and broken reserve was reduced by 35,375 tons to a total, on 1 January 1962, of 220,078 tons estimated to average 0.40 ounce of gold per ton.

New ore developed by drifting and raising during the year amounted to only 5,720 tons averaging 0.30 ounce per ton. The remainder of the addition to the reserve arose from mining beyond previously established ore limits, principally in stoping blocks on the bottom levels.

The total reserve, including probable ore and that at present unavailable for mining, stood at 314,568 tons.

Operating Costs

Total operating expense in 1961, not including provisions for depreciation and deferred development, but including Wright-Hargreaves' share of the cost of underground exploration undertaken jointly with Sylvanite, was \$2,169,837 or \$13.64 per ton of ore milled and \$36.85 per ounce of gold recovered.

Comparable costs in the previous year were \$13.52 per ton of ore milled and \$35.61 per ounce of gold recovered.

Comparative operating costs per ton of ore milled and per ounce of gold recovered for the past two years are shown as follows:

COMPARISON OF OPERATING COSTS

| | 1961 | | 1960 | |
|---|----------------|--------------------------|----------------|--------------------------|
| | Per Ton Milled | Per Ounce Gold Recovered | Per Ton Milled | Per Ounce Gold Recovered |
| Mine development..... | \$ 0.57 | \$ 1.54 | \$ 1.16 | \$ 3.05 |
| Mining..... | 8.01 | 21.65 | 7.57 | 19.95 |
| Milling..... | 1.92 | 5.18 | 1.63 | 4.30 |
| General expense at property..... | 1.64 | 4.43 | 1.72 | 4.53 |
| Mine office and supervision..... | 0.76 | 2.04 | 0.76 | 1.99 |
| Marketing expense..... | 0.10 | 0.28 | 0.11 | 0.29 |
| Administration and corporation expense..... | 0.50 | 1.35 | 0.45 | 1.18 |
| Mining taxes..... | 0.14 | 0.38 | 0.12 | 0.32 |
| Total..... | \$13.64 | \$36.85 | \$13.52 | \$35.61 |
| Milled..... tons | 159,078 | | 164,985 | |
| Gold recovered..... oz. | 58,890.632 | | 62,634.911 | |

The average number of employees was 382: 273 underground, and 109 on surface. Frank Buckle was general manager.

IRON ORE AND IRON

Shipments of ore increased 8.45 percent in quantity and 28.85 percent in value over the 1960 shipments. About 74 percent of the ore was shipped to plants in the United States. A small shipment was made to England by one company.

The industry paid \$3,996,157 to 456 salaried employees, and \$10,031,778 to 1,863 wage-earners. Fuel and electricity used cost \$3,022,067, and process supplies used cost \$4,769,915.

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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 Algoma Steel Corporation Limited. The authorized capitalization is 15,099,880 shares of no par value, of which 5,786,192 shares have been issued. The directors and officers were: D. S. Holbrook, president and director; E. G. McMillan, vice-president and director; J. B. Barber, vice-president (finance) and director; G. C. Batemen, 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

The Algoma Ore Properties Division holds various iron properties in the district of Algoma, including the Helen mine, the George W. MacLeod mine, and the Sir James mine 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 eighty-six claims in ranges 23 and 24, Township 29, District of Algoma.

SHAFTS, HELEN MINE

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

No drifting, crosscutting, or raising was completed in 1961. Total development footage to 31 December 1961 was as follows: drifts, 97,439 feet; crosscuts, 12,840 feet; raises, 39,969 feet. Diamond-drilling in 1961 consisted of 7 holes, totalling 891 feet, from surface.

A total of 751,203 tons of ore was hoisted.

GEORGE W. MacLEOD MINE

This property consists of fourteen claims in ranges 23 and 24, Township 29, District of Algoma. Operations continued throughout 1961.

SHAFTS, GEORGE W. MACLEOD MINE

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

During 1961, a total of 15,284 feet of drifting, 2,672 feet of crosscutting, and 4,676 feet of raising was completed. Total development footage to 31 December 1961 was as follows: 54,105 feet of drifts; 16,022 feet of crosscuts; 21,913 feet of raises. Diamond-drilling in 1961 consisted of 96 holes, totalling 23,267 feet, from underground.

New construction in the sinter-plant area included the following: extension to sinter plant, change house, and office building, of tile and concrete construction.

Extension to main warehouse building (60- x 80-ft., of steel and sheet metal construction).

Two oil-storage houses (one 14 x 14 ft., one 10 x 25 ft., of concrete-block construction).

New construction in the mine area comprised the following:

- Administration building (brick and concrete-block construction).
- Change house (steel and concrete-block construction).
- Mine repair-shop (steel and concrete-block construction).
- Ropeway change house (concrete-block construction).
- Pump house at Moran Lake (concrete-block construction).
- Water tank (steel, 100,000-gal. capacity).
- Asphalt service road to airport (3,200 ft. long, 20 ft. wide).
- Mine and plant access roads (about 25,000 ft. long, 20 ft. wide, H. I. 4 asphalt construction).

The following was added new equipment:

- Water main (8-in. steel, capacity 400-gpm.), at the mine.
- Tractor (Caterpillar D7), at the sinter plant.
- Vibrating feeder (48- x 60-in.), at the sinter plant.
- Bin vibrator (V.500), at the sinter plant.
- Dust collector (Wheelabrator, 28,000 cfm.), at the ore-preparation plant.
- Dust collector (Sly Dyna Clone, 8,600 cfm.), at the coke plant.

A total of 543,087 tons of ore was hoisted and conveyed.

SIR JAMES MINE

This property consists of two 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 1961.

Diamond-drilling in 1961 consisted of 12 holes, totalling 3,057 feet, from surface.

A total of 1,119,322 tons of ore was hoisted and conveyed.

GOUDREAU PYRITE PROPERTY

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 ten claims, located in Township 27, range 26, in the Sault Ste. Marie mining division. Plant and equipment used

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in the operation is owned and provided by the contractor. Operations continued throughout 1961.

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

Some 48 diamond-drillholes, totalling 4,579 feet, were completed from surface.

A total of 204,289 tons of pyrite was mined. The contractor employed an average of 32 men: 20 in the pit, and 12 on surface.

The total ore production from the Helen, George W. MacLeod, and Sir James mines and the Goudreau Pyrite property was 2,617,901 tons, from which 162,426 tons was discarded; 1,026,885 tons was concentrated, producing 864,459 tons of concentrate; 864,463 tons of concentrate and 1,528,504 tons of ore without concentration was sintered, producing 1,631,231 tons of sinter.

The average number of employees at the mines was 678: 344 underground, and 334 on surface. A further 230 men were employed at the sinter plant. C. M. Beck was general manager; J. E. Worley was mine manager.

ALGOMA STEEL CORPORATION DIVISION

The blast furnace section of the corporation is located at Sault Ste. Marie. Operations continued throughout 1961. No. 1 blast furnace has been dismantled; No. 2 furnace was idle.

PRODUCTION OF IRON, ALGOMA STEEL CORPORATION DIVISION

| Furnace | 1961 | | 1960 | |
|------------|-------------------|------------|---------------------|------------|
| | Days of Operation | Production | Months of Operation | Production |
| No. 3..... | 246 | 172,216 | 10 | 207,466 |
| No. 4..... | 228 | 120,576 | 6 | 98,648 |
| No. 5..... | 365 | 664,219 | 10 | 502,431 |
| No. 6..... | 363 | 617,413 | 12 | 531,386 |
| Total..... | — | 1,574,424 | — | 1,339,931 |

The No. 5 blast furnace was equipped for coke-oven gas injection and a pneumatic tap-hole drill was installed. The capacity of 10 iron ladles was increased from 125 to 150 gross tons.

The sintering plant of the corporation, located at Wawa, operated a total of 355 days during 1961.

The average number of employees in the blast furnace section was 712. 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 for a total of 277 days during 1961 and produced 158,518 tons of pig iron.

The average number of employees was 144. Thomas Cordner was general superintendent.

The following is taken from the corporation's annual report for the year ending 31 December 1961:

Production and shipments of Algoma sinter by the Algoma Ore Properties Division were:

| | Thousands of Gross Tons | |
|-----------------|-------------------------|-------|
| | 1961 | 1960 |
| Production..... | 1,631 | 1,707 |
| Shipments..... | 1,634 | 1,429 |

As a result of a higher than normal inventory of sinter at the end of 1960, and continuing low demand from United States producers, production was reduced about 30 percent until the end of the first quarter of 1961. Full production was then resumed and maintained for the balance of the year, to supply the increased requirements of the steelworks at Sault Ste. Marie.

At Michipicoten, about 46 percent of the raw ore sintered came from the Sir James mine open-pit operation, 31 percent from the Helen underground mine, and 23 percent from the George W. MacLeod mine, which is also an underground operation.

Sinter shipped to Sault Ste. Marie and Port Colborne for use in the corporation's blast furnaces amounted to 60 percent of total production.

The Helen underground mine is practically depleted, and in 1962 it is expected that 74 percent of total raw ore requirements will be from the George W. MacLeod mine, and 26 percent from the Sir James mine.

Expenditures on the George W. MacLeod mine, including all development work, mining plant and equipment, an aerial ropeway, additions to processing plants, and service and stock-piling facilities amounted to \$21,900,000, from 1951 to the end of 1961. This mine was brought into full production in the last quarter of 1961, and future expenditures will be for stope development work as required for mining operations.

Research is continuing into methods of improving the metallurgical grade and physical qualities of Algoma sinter. During 1961 a pilot plant was set up near the sinter plant at Michipicoten to carefully size the sinter, and the product was experimentally tested in the steelworks blast furnaces, with excellent results. Plans are being completed for installation of a permanent plant to size all sinter as it is produced. It is estimated that this installation will cost about \$2,000,000 and be completed by the end of 1962. The cost of operating the sizing plant will be more than offset by economies in the steelworks blast furnace operation resulting from use of the improved sinter.

A promising low-grade magnetite iron deposit north of Sault Ste. Marie is being thoroughly investigated. Metallurgical tests show that ore from this deposit could be processed into a high-grade concentrate, which could be used advantageously by the corporation, without lessening the use of Algoma sinter. Further exploratory diamond-drilling and metallurgical testing are being undertaken.

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 have been issued. The directors and officers were: J. B. Knaebel, president and managing director; J. S. Vanderploeg, Mord Lewis, and J. J. Gourd, vice-presidents and directors; W. T. Swensen, assistant vice-president and director; A. R. McGinn, secretary-treasurer and director; P. E. Riverin J. Monette, R. S. Newlin, and C. J. Parkinson, directors. The head office is at Eighth Street, New Toronto. The executive office and mine address is 105 North Cumberland Street, Port Arthur.

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

Operations at the property continued throughout 1961. Further metallurgical testing of bulk samples was continued in the 100-ton-per-day pilot mill. A total

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of about 1,351 feet of trenching, averaging 4 feet in depth, was completed in 1961. Some 52 diamond-drillholes, totalling 40,017 feet, were completed from surface.

The average number of employees on surface was 102. 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, all of which have been issued. It is a wholly-owned subsidiary of Inland Steel Company, of Chicago. The directors and officers were: P. D. Block Jr., chairman and director; C. B. Jacobs, president and director; R. D. Satterley and H. M. Graff, vice-presidents and directors; 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; J. C. Carter, assistant secretary. The head office is at 30 West Munro Street, Chicago 3, Ill., U.S.A. The mine address is Atikokan.

The property consists of 60 claims, in Schwenger and Freeborn townships, District of Rainy River, and includes 31 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. Operations continued throughout 1961.

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 1961 consisted of 935 feet of crosscutting and 166 feet of raising. Total development footage to 31 December 1961 was as follows: 205 feet of drifts; 5,171 feet of crosscuts; and 976 feet of raises. Some 14 diamond-drillholes, totalling 6,589 feet, were drilled from surface in 1961.

New construction included a pit service shop (220 x 40 x 14 ft., prefabricated steel construction).

Major equipment added in 1961 was as follows:

- 2 trucks (Euclid, R-45, 9FFD, 45-ton).
- 2 trucks (Le Tourneau Westinghouse Haulpak, LW 32, 32-ton).
- 1 tractor-dozzer (Caterpillar, D8).

All production in 1961 was from the open pit and consisted of 1,009,356 tons of iron ore.

The average number of employees was 226: 76 underground, and 150 on surface. P. P. Ribotto, vice-president, was in charge at the property.

Canadian Charleston Limited

Canadian Charleston Limited, incorporated in April 1955, is a wholly-owned subsidiary of Charleston Mining Company at Hibbing, Minn., U.S.A. The directors and officers were: J. J. Dwyer and W. D. Hamilton, vice-presidents and directors; Courtney Burton, F. R. White, and B. L. Knudsen, directors; E. W. Sloan Jr., president; A. E. Wheeler, secretary; C. W. Ferris, treasurer. The head office is at 25 King Street West, Toronto. The mine address is Box 1510, Atikokan.

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

The open pit and concentrator did not operate during 1961. A total of 17,855 tons of iron ore concentrate was shipped from the stockpile during the months of June and July.

The average number of employees was four; C. F. Bauers was 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 had been issued as of April 1961. The directors and officers were: H. L. Isaacs, president and director; W. M. Gordon, secretary and director; J. L. Kemmerer Jr., P. Porzelt, C. B. Schubert, and A. S. Miller, directors; G. T. Smith, treasurer. The head office is at 18 Toronto Street, Toronto 1. The mine address is Kowkash.

The property consists of about 300 claims in Paska, Kowkash, Oboshkegan, and Gzowski townships, District of Thunder Bay, about 6 miles south of Kowkash on the Canadian National railway.

The company carried out an exploration and diamond-drilling program on an iron prospect. Diamond-drilling in 1961 consisted of 17 holes, totalling 7,828 feet, from surface. Further iron determinations were made in the laboratory during 1961.

The average number of employees was 6; Dr. B. K. Meikle, was in charge at the property.

Dominion Foundries and Steel Limited

Dominion Foundries and Steel Limited was incorporated in May 1917. The authorized capitalization was 51,731 preferred shares of \$100 par value and 5,000,000 common shares of no par value, of which 27,319 preferred and 3,558,457 common shares have been issued. The officers were: F. A. Sherman, chairman; A. G. Wright and F. A. Loosley, vice-chairmen; F. H. Sherman, president and general manager; D. F. Hassel, vice-president; R. R. Craig, vice-president (sales); D. O. Davis, vice-president (engineering); D. A. Lindsey, vice-president (purchases); J. G. Sheppard, secretary and comptroller. The head office and plant is at Hamilton.

PRODUCTION OF IRON, DOMINION FOUNDRIES AND STEEL

| Furnace | 1960 | | 1961 | |
|-------------|----------|------------|----------|------------|
| | Operated | Production | Operated | Production |
| | days | tons | days | tons |
| No. 1 | 241 | 239,891 | | |
| No. 2 | 356 | 401,118 | 365 | 434,011 |
| No. 3 | 128 | 137,752 | 365 | 550,155 |
| Total | — | 778,861 | — | 984,166 |

Operations continued throughout 1961.

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No. 1 blast furnace was down during 1961 for relining and repairs to the ancillary equipment. Nos. 2 and 3 blast furnaces operated at capacity.

No. 2 blast furnace was the first to be designed and built with a fuel injection system pioneered by the company, which will permit the use of heavy oil (Bunker-C) in addition to the normal coke fuel. The increase in operating blast furnace temperature, with an increase in beneficiated materials, has resulted in increased production.

The ore dock was extended, and a new ore bridge installed to facilitate the movement of ore to the blast furnaces as well as for unloading ships. The new Bay Front pump house and water system was completed to replace the former 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 psi.), which are used in the Cyanamid plant to produce urea.

The average number of employees in the blast furnace division was 160. H. C. Taylor was superintendent; Lloyd Thomas was assistant superintendent.

Lowphos Ore Limited (MOOSE MOUNTAIN MINE)

Lowphos Ore Limited, incorporated in July 1941, is a subsidiary of National Steel Corporation and operates under the direction of the Hanna Iron Ore Division of the corporation. The directors and officers were: W. A. Marting, president and director; R. W. Whitney and E. S. Mollard, vice-presidents and directors; 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 1961.

Some 17 diamond-drillholes, totalling 4,779 feet, were drilled from surface. New equipment added included a Trump Giraffe (model IG 50 GW, M. L. Baxter Ltd., Toronto); a truck (Euclid, R.27 model 65TD, Blackwood Hodge, Toronto).

A total of 1,471,491 tons of ore was mined in the open pit; 1,463,065 tons was milled, at an average of 4,008 tons per day.

The average number of employees was 189: 103 in the open pit, and 86 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; W. H. Johnstone and P. B. Entekin, 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. S. Killian and E. P. Leach, 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, and 17 July to 31 December, 1961.

A front-end angle dozer (Michigan, model 280) was added equipment in 1961.

A total of 1,191,861 tons was mined in the open pit, from which 294,546 tons was discarded. The mill treated 897,315 tons of ore, averaging 2,769 tons daily, and produced 503,995 tons of pellets.

The average number of employees was 295: 69 in the open pit, and 226 on surface. 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 4,485,123 shares have been issued. The directors and officers were: J. R. Bradfield, president and director; R. V. Porritt, executive vice-president and director; N. C. Urquhart and W. S. Row, vice-presidents and directors; F. M. Connell, J. Y. Murdoch, J. I. Rankin, Jean Raymond, H. L. Roscoe, L. H. Timmins, J. R. Timmins, and A. O. Dufresne, 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 1961.

The decreased sulphuric acid demand, due to the closure of a number of the Elliot Lake uranium mills, reduced the plant production capacity to 360 tons of acid per day. The 1961 production consisted of 125,500 tons of sulphuric acid and 56,900 tons of iron calcine.

The average number of employees was 120. W. Seniuk 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, 5,061,394 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; Allan Graydon, G. A. R. Hart, Frederick Johnson, R. A. Laidlaw, L. L. Lang, J. R. Gordon, H. Greville Smith, and H. G. Welsford, directors; R. B. Taylor, vice-president and treasurer; N. J. Brown, vice-president and comptroller; H. M. Mawhinney, and H. J. Clawson,

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

PRODUCTION, STEEL COMPANY OF CANADA, 1960 AND 1961

| Furnace | 1960 | | 1961 | |
|-------------|----------|-------------------|----------|-------------------|
| | Operated | Pig Iron Produced | Operated | Pig Iron Produced |
| | days | tons | days | tons |
| A | 362 | 102,963 | 361 | 110,909 |
| B | 221 | 179,169 | 298 | 283,550 |
| C | 286 | 349,404 | 349 | 434,666 |
| D | 347 | 692,235 | 354 | 690,805 |
| Total | — | 1,323,771 | — | 1,519,930 |

The sinter plant operated at capacity during 1961. Ancillary equipment revisions and installations were carried out with a view to reducing dust.

All four blast furnaces produced at capacity throughout the year, except B furnace, which was relined and in blast from 4 March. The trend to pellets and to self-fluxing sinter (both are beneficiated materials), as compared to straight ore burden, increased, with favourable results. Varying the furnace burden and the operating practices also gave encouraging results.

Natural-gas injection was introduced at D and B furnaces to supplement coke as a fuel. Similar trials are contemplated on C furnace during 1962. Speedier production and smoother operations were achieved with a reduction in coke rate.

A new process for the direct reduction of iron ore into metallic iron has been developed, and a pilot plant is in operation. This work has been carried out in conjunction with the Lurgi-Chemie Company, of Frankfurt, West Germany.

The reduction of the ore is carried out in a horizontal rotary kiln, using natural gas and coal as fuel and for reducing the ore. The temperature inside the kiln is closely controlled by introducing fuel and air at intervals along the kiln, the quantities being governed by temperature measurements taken along the entire kiln length. High-grade ores or concentrates in the form of pellets are preferred as a charge for the process.

The metallic iron as discharged by the kiln is porous and is frequently referred to as sponge. This sponge can be used as feed for steelmaking furnaces such as electric furnaces, oxygen converters, or for ironmaking furnaces such as cupolas. The sponge may be either in its original form or compressed into briquettes. The degree of reduction of the sponge can be controlled and can be greater than 95 percent. The iron content may be between 90 and 98 percent depending upon the chemical composition of the charged ore or pellets.

The results that have been obtained in the pilot-plant operation are very encouraging. A high degree of reduction to metallic iron and an efficient utilization of the fuel are being obtained without difficulty.

The average number of employees was 540. C. M. Birkett was works manager; J. S. McMahan was superintendent and J. A. Peart assistant superintendent in the blast furnace division; J. G. Sibakin was manager (research and development).

Steep Rock Iron Mines Limited

Steep Rock Iron Mines Limited was incorporated in February 1939. Early in 1955 the authorized capitalization of 30,000 shares of preferred stock of \$100 par value and 10,000,000 shares of common stock of \$1 par value was changed to 10,000 shares of preferred stock of \$100 par value and 10,666,666 shares of common stock of \$1 par value. The 20,000 previously issued shares of preferred stock were converted into 666,666 shares of common. The number of shares issued at 31 December 1961 was: common 8,058,739; preferred, none. The directors and officers were: Cyrus S. Eaton, chairman of the board and director; M. S. Fotheringham, president, general manager, and director; Neil Edmonstone, vice-president, secretary-treasurer, and director; W. R. Daley, J. G. Cross, G. E. Allen, Mark McKee, John Paterson, F. H. Black, D. D. Hogarth, and C. J. Burchell, directors. The head office and mine office are at Steep Rock Lake.

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

Operations continued throughout 1961. The amount of ore mined during the year is shown in the following table:

| | |
|--|-----------|
| | Tons |
| A orebody (Hogarth, open pit) | 1,770,307 |
| B orebody (Errington, underground) | 173,674 |
| | 1,943,981 |

A total of 1,213,858 tons of ore was shipped.

A (HOGARTH) OREBODY

Open-pit mining continued throughout 1961; 1,770,307 tons of ore was mined. A total of 693,893 cubic yards of stripping was completed.

Five diamond-drillholes, totalling 1,187 feet, were drilled from surface.

New construction included No. 2 screening plant, a Butler building (147.3 x 30.3 ft.), and a scalping plant (open steel frame construction, 14 x 14.8 ft.).

New equipment added included: a screen (C.A.C. Lo Head, 6 x 14 ft., cap. 150 lt. per hr.); 5 screens (C.A.C. Lo Head, 6 x 16 ft., cap. 150 lt. per hr.); vibrating feeders (syntron, 48 x 54 ins.); a portable lighting plant (6 kva., 110-volt diesel drive). Preparations for underground mining were continued from 1 January to 31 August, 1961.

SHAFTS, A (HOGARTH) OREBODY

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

Development footage in 1961 consisted of 1,161 feet of drifting and 1,477 feet of crosscutting. Total development footage to 3 December 1961 was as follows: 1,477 feet of drifts; 5,169 feet of crosscuts; 1,040 feet of raises. Five diamond-drillholes, totalling 1,431 feet, were completed from underground. A total of 36,462 tons of development waste was disposed of.

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B (ERRINGTON) OREBODY

Underground mining on the B (Errington) orebody continued throughout 1961.

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 |

The 400 level was established in the B1 Errington shaft at a vertical depth of 425 feet below the collar. Development footage in 1961 consisted of 4,901 feet of drifting, 161 feet of crosscutting, and 792 feet of raising. Total development footage to 31 December 1961 was as follows: 36,514 feet of drifts; 13,086 feet of crosscuts; 7,795 feet of raises. Diamond-drilling in 1961 consisted of 29 holes, totalling 4,372 feet, from underground. A total of 173,164 tons of ore was hoisted; 20,155 tons of waste was discarded.

ROBERTS OPEN-PIT MINE

The dredging of the G ore zone was resumed on 4 May, and completed at the year's end. A total of 652,615 cubic yards of material was removed from this part of the G ore zone, which is called the Roberts mine. Some 17 diamond-drillholes, totalling 9,989 feet, were completed from surface. Production is planned in 1962 from an open-pit operation.

The following is taken from the president's and general manager's report for the year ending 31 December 1961:

Operations and Development

As scheduled, full-scale operations in the Hogarth open pit concluded in 1961, with shipments of 1,109,679 tons and stockpiling of 296,000 tons of direct-shipping ore. A further 275,000 tons will be added to stockpile during 1962 winter operations. In addition, 771,000 tons of crude ore suitable for concentration will be stockpiled before completion of operations in this pit.

A vigorous effort to achieve further increases in efficiency produced results. One of these was a 6-percent improvement over 1960 in costs on open-pit operations. Employees' earnings have been increased by 20 percent since the last increase in ore prices in 1957.

Shipments from the Errington underground mine were 104,179 tons, with a gross value of \$1,275,000. By 31 December, 161,000 tons of direct-shipping and concentrating ore from this mine had also been placed on stockpile. Extensive and imaginative experimental work on methods and procedures in the Errington underground mine are beginning to yield tangible results, and the operating organization anticipates higher volume production towards the end of the current year.

Development of the G ore zone again served as the largest single factor in the capital expenditure program. As forecast last year, the G ore zone dredging project was completed in December 1961, and a new open-pit mine will come into production in 1962. Initial 1962 shipments will come from the Hogarth open-pit stockpile and the Errington underground mine. The required balance will be drawn from the G open pit. This part of the G ore zone is being named the Roberts mine, after the company's distinguished consulting geologist, Hugh M. Roberts, of Duluth, Minn. U.S.A.

An extensive engineering examination, culminating in a computer study, has indicated an open-pit reserve of 14,000,000 tons in the Roberts mine. This does not include substantial additional ore material that will be developed in areas of the G ore zone outside the confines of the Roberts mine.

In view of the substantial reserves of open-pit ore available, development operations in the Hogarth underground mine were placed on a standby basis during the year.

Exploration

The Lake St. Joseph property, as previously reported, continued to afford a most impressive opportunity for early development. Feasibility reports indicate an annual capacity of 3,000,000 tons of pellets over an open-pit life of fifty years for this project, which remains under consideration by steel interests.

The exploration department continues to search for promising new prospects. Steep Rock is situated on the edge of the great Canadian Precambrian Shield, where new scientific methods in exploration and discovery should ultimately bring rich rewards. The company is taking aggressive steps to keep abreast of such developments.

Changing Steel and Iron Ore Technology

Steep Rock continues to direct its active and extensive research program towards keeping its ore to the forefront among producers of the Lake Superior area. The company's relative position among these shippers attests to the success of this policy. Operating one of the largest group of mines in the area, Steep Rock has ranked among the big ten in tonnages shipped for five successive years.

Although much of Steep Rock's ore will continue to command a ready market in its present form, changing iron and steel technology indicates a growing future demand for an agglomerate product. Studies have proven the technical feasibility and economic attraction of such treatment of Steep Rock ore. These continuing studies are directed towards production of agglomerates by 1964-65.

The average number of employees was 682: 372 underground, and 310 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: F. W. Chambers, president and director; R. O. Denman, M. C. Udy, J. C. Udd, and F. C. Senior, directors; E. H. Damon, secretary; W. H. Dalman, treasurer; H. O. Tervo, assistant treasurer; R. D. Howe and R. D. Weldon, assistant secretaries. The head office and plant is at 3527 Stanley Avenue, Niagara Falls.

The plant consists of four separate operational departments as follows:

1. A crushing plant capable of handling 50 tons per hour.
2. A concentration mill, equipped with wet and dry magnetic separators, capable of handling up to 10 tons of ore per hour. This is believed to be the largest custom pilot concentrating plant in Canada.
3. A prototype smelting plant, equipped with one rotary kiln (5 ft. 6 in. x 80 ft.), three smelting furnaces (1,000 kva.), and one steel refining furnace (3-ton).
4. A commercial smelting plant consisting of one rotary kiln (8 ft. x 150 ft.) and one smelting furnace (10,000 kva.). This installation was designed to smelt ferrochromium from chrome ore fines and is believed to be the largest furnace of its type in the world.

The highlight of the year was the start-up of the new smelting plant (10,000 kva.) in June 1961. Initially, the plant was operated on iron ore fines to demonstrate the production of the pig iron by the Strategic-Udy process. Some 2,900 tons of pig iron were produced at a rate of 80-90 tons per day. In December, the plant started producing ferrochromium and was producing over 50 tons per day by the end of the year.

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In addition, the crushing and concentration plant was completed, and some 2,200 tons of ore from northern Ontario was processed. The magnetic concentrates were smelted in the prototype plant to produce pig iron and semi-steel.

Three other smelting campaigns were made in the prototype plant, two lasting about six months, producing ferrochromium, and the other, on a European ore, to produce pig iron and semi-steel.

The average number of employees was 110. W. Scott Douglas was general manager.

LEAD AND ZINC

Production of lead was up 0.52 percent in quantity and down 3.90 percent in value compared with 1960. Zinc production increased 14.82 percent in quantity and 8.29 percent in value over 1960. All of the zinc produced came from the Manitouwadge area, as did all the lead except for 53,300 pounds from the concentrates shipped from the silver-cobalt mines of Cobalt and Gowanda.

The mines in Manitouwadge paid \$748,285 to 149 salaried employees, and \$3,421,325 to 653 wage-earners. They used fuel and electricity worth \$518,230, and process supplies worth \$1,511,170.

For operations at the mines see NICKEL AND COPPER.

MAGNESIUM AND CALCIUM

These metals are produced in Ontario by Dominion Magnesium Limited. Production of calcium was down 26.29 percent in quantity and 36.64 percent in value from 1960. The quantity of magnesium was up 4.75 percent, but the value of the product decreased 1.49 percent.

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 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. Woodroffe, 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 1961 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 addition to the furnace building (94 x 120 ft.) and the installation of four gas-fired furnaces. Natural gas was piped to Haley primarily for use in the new furnaces, but is also replacing coal and oil as a fuel in the rotary kilns and melting furnaces.

Production of metals for 1960 and 1961 was as follows:

| | 1960 | 1961 |
|----------------------|------------|------------|
| | pounds | pounds |
| Calcium metal..... | 144,372 | 165,227 |
| Magnesium metal..... | 15,040,383 | 14,272,287 |
| Thorium..... | 32,381 | 34,777 |
| Titanium..... | 2,115 | 9,505 |
| Barium..... | 529 | 260 |
| Strontium..... | 44 | 18 |
| Zirconium..... | — | 11,312 |

The following is taken from the report of the president and the general manager for the year ending 31 December 1961:

The plant operated at its full capacity of ten electrically heated furnaces until December, when one furnace was shut down for repairs and two of the newly installed natural-gas-fired furnaces were placed into operation.

The last annual report expressed the necessity of expansion, and plans for the installation of four natural-gas-fired reduction furnaces were completed, thereby providing an additional capacity of 2,000 tons of magnesium per year. Construction started late in May, and two of the furnaces were in operation early in December. During this time the kilns and melt plant were converted to natural-gas firing. It is anticipated that the use of gas in place of other fuels will result in more efficient operation.

In order to maintain low-cost ferrosilicon for the increased production facility at Haley, an agreement was made with Chromium Mining and Smelting Corporation Limited to share the cost of installing additional arc-furnace capacity at the Beauharnois, Quebec, ferrosilicon plant. Construction commenced in September, and at the date of this report the new furnace was in the process of tuning up.

The research program on reduction furnace designs is continuing. A pilot model furnace was installed on the reduction floor and operated throughout the year.

The average number of employees was 408: 398 in the plant, and 10 in the quarry. D. J. McPhail was plant manager.

NICKEL AND COPPER

The quantity of nickel produced in 1961 decreased 2.68 percent from the 1960 production, but the value of the product was 6.30 percent greater. The quantity of copper increased 2.61 percent, and the value decreased 1.07 percent. The 66,305,600 pounds of copper produced in Timagami and Northwestern Ontario was a decrease of 3.83 percent from 1960, and the value of \$19,354,616 was a decrease of 7.32 percent. New producers in the Porcupine and Elliot Lake areas brought 11,791,000 pounds valued at \$3,442,000 into the Ontario total.

NICKEL AND COPPER MINING AND SMELTING

| | 1957 | 1958 | 1959 | 1960 | 1961 |
|--|------------|------------|------------|------------|------------|
| | tons | tons | tons | tons | tons |
| Ore treated..... | 16,474,142 | 11,735,895 | 16,554,454 | 19,002,040 | 18,896,447 |
| Copper in blister produced in Ontario..... | 155,987 | 125,895 | 170,116 | 186,046 | 192,624 |
| Nickel produced in Ontario..... | 117,992 | 71,422 | 110,282 | 126,243 | 111,174 |
| Matte exported..... | 99,817 | 93,748 | 107,131 | 125,333 | 136,405 |
| Nickel content of matte exported..... | 60,364 | 55,899 | 63,682 | 75,407 | 85,478 |
| Copper content of matte exported..... | 15,900 | 16,185 | 18,156 | 20,226 | 19,022 |

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 |
| 1957 | 4 | \$65,206,713 | 20 mines ⁽¹⁾ 4 smelters 2 refineries | 1,047 1,145 363 | \$ 7,069,063 6,962,569 2,132,908 | 10,338 6,494 2,682 | \$49,003,038 29,542,695 11,836,568 | Nickel in matte Metallic nickel Nickel oxide and salts Copper in matte Converter copper Gold Silver Platinum metals Selenium and tellurium Cobalt Pyrrhotite Sulphur | \$ 79,601,346 143,163,737 20,221,978 8,427,008 83,741,114 1,455,768 1,376,188 25,731,333 963,150 4,889,505 685,335 542,846 |
| 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⁾ 4 smelters 2 refineries | 1,003 1,105 347 | \$ 6,940,510 7,607,745 2,243,207 | 9,334 6,153 2,303 | 35,348,771 21,096,430 7,542,760 | Nickel in matte Metallic nickel Nickel oxide and salts Copper in matte Converter copper Gold Silver Platinum metals Selenium and tellurium Cobalt Pyrrhotite Sulphur | \$ 76,338,284 90,601,931 10,108,807 7,526,058 45,890,976 1,609,530 1,056,920 14,321,443 688,589 3,359,984 655,569 622,619 |
| Total | | \$42,425,991 | | 2,455 | \$16,791,462 | 17,790 | \$63,987,961 | | \$252,780,710 |
| 1959 | 3 | \$48,267,656 | 16 mines ⁽¹⁾ 4 smelters 2 refineries | 975 1,108 374 | 7,146,760 7,112,238 2,476,620 | 9,270 6,308 2,538 | 45,601,540 29,320,254 11,219,286 | Nickel in matte Metallic nickel Nickel oxide and salts Copper in matte Converter copper Gold Silver Platinum metals | \$ 85,970,920 138,036,499 15,912,284 9,804,234 82,322,026 1,427,027 1,215,071 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 |
| | | | | | | | | | | Nickel in matte | \$101,799,347 |
| | | | | | | | | | | Metallic nickel | 153,956,279 |
| | | | | | | | | | | Nickel oxide and salts | 22,038,141 |
| | | | | | | | | | | Copper in matte | 11,043,287 |
| | | | | | | | | | | Converter copper | 91,738,960 |
| 1960 | 3 | \$50,158,396 | { 19 mines ⁽¹⁾ 4 smelters .. 2 refineries .. | 1,093 1,151 409 | 8,071,601 7,562,771 2,786,892 | 10,209 6,523 2,710 | \$51,784,392 31,341,853 12,512,226 | | | 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 |
| | | | | | | | | | | Nickel in matte | \$126,507,279 |
| | | | | | | | | | | Metallic nickel | 145,861,044 |
| | | | | | | | | | | Nickel oxide and salts | 22,991,719 |
| | | | | | | | | | | Copper in matte | 9,967,622 |
| | | | | | | | | | | Converter copper | 89,604,061 |
| 1961 | 3 | \$53,430,569 | { 18 mines ⁽¹⁾ 4 smelters .. 2 refineries .. | 1,124 1,182 418 | 8,454,795 7,830,457 2,950,140 | 10,473 6,334 2,613 | 54,191,874 31,302,063 12,410,680 | | | Gold | 2,083,948 |
| | | | | | | | | | | Silver | 1,683,147 |
| | | | | | | | | | | Platinum metals | 24,534,349 |
| | | | | | | | | | | Selenium and tellurium .. | 1,110,243 |
| | | | | | | | | | | Cobalt | 4,147,340 |
| | | | | | | | | | | Iron ore | 3,281,209 |
| | | | | | | | | | | Sulphur | 833,706 |
| Total | | \$53,430,569 | | 2,724 | \$19,235,392 | 19,420 | \$97,904,617 | | | | \$432,605,667 |

(1) The figures for "mines" include the following that were active but non-producing:
 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—Clabelle, Copper Cliff North, Crean Hill (International Nickel), Boundary, Strathcona (Falconbridge).
 1961—Crean Hill, Copper Cliff North (International Nickel), Strathcona (Falconbridge), and Nickel Mining and Smelting Corporation.
 (2) Only 9 month's operation by International Nickel Company of Canada Limited.

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PRECIOUS METALS RECOVERED

| | 1957 | 1958 | 1959 | 1960 | 1961 |
|-------------------------|------------|------------|------------|------------|------------|
| Platinum metals.....oz. | 416,147 | 300,458 | 329,081 | 483,585 | 418,278 |
| \$ | 25,731,333 | 14,321,443 | 16,932,178 | 28,871,955 | 24,534,349 |
| Gold.....oz. | 43,391 | 47,367 | 42,509 | 56,665 | 58,769 |
| \$ | 1,455,768 | 1,609,530 | 1,427,027 | 1,923,777 | 2,083,948 |
| Silver.....oz. | 1,576,138 | 1,217,510 | 1,384,223 | 1,665,314 | 1,785,643 |
| \$ | 1,376,188 | 1,056,920 | 1,215,071 | 1,480,631 | 1,683,147 |
| Total.....\$ | 28,563,289 | 16,987,893 | 19,574,276 | 32,276,363 | 28,301,444 |

The nickel-copper industry of Sudbury milled 17,461,000 tons of ore, recovering 392,347,297 pounds of nickel valued at \$295,360,000 and 345,012,700 pounds of copper valued at \$99,572,000. The amount of nickel produced outside the Sudbury area was 88,476 pounds valued at \$63,107.

Also recovered in the processing of the ores of the Sudbury area was the entire amount of the province's platinum metals, selenium, and tellurium, and 96.55 percent of its cobalt. The table on pages 86 and 87 gives details of the production of metals for the nickel-copper industry. The value of precious metals recovered was \$28,301,444.

The industry paid \$19,235,392 to 2,724 salaried employees, and \$97,904,617 to 19,420 wage-earners. Fuel and electricity used cost \$23,206,972, and process supplies used cost \$30,348,357.

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. Operations continued throughout 1961.

No. 1 plant produced 35,188 tons of acid, averaging 96 tons daily. The plant was shut down for repairs in early December.

No. 2 plant produced 83,404 tons of acid, averaging 229 tons daily.

The liquid sulphur dioxide plant produced 82,506 tons. There was a three-week shutdown in December for maintenance and repairs.

The average number of employees was 92. 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 2,041,520 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 is at 80 Richmond Street West, Toronto 1. The mine address is Matachewan.

The company's holdings comprise sixteen claims located in James and Tudhope townships, District of Timiskaming. The James township property, where work was conducted from July to December, 1961, is in the Elk Lake area.

Work consisted of drilling some 27 diamond-drillholes, totalling 7,271 feet, from surface.

G. S. Welsh, president, was in charge during the period of operation, and two men were employed.

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 3,781,172 shares 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 1. 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, excluding employees of contractors, employed at mining operations in Ontario, was 2,953; E. L. Healy 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 is given in this report under Norduna Mines Limited, page 94).

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

| | Inclination | Number of Compartments | Sinking in 1961 | Total Depth from Surface |
|---|-------------|------------------------|-----------------|--------------------------|
| | | | feet | feet |
| FALCONBRIDGE | | | | |
| No. 1 shaft | Vertical | 3 | — | 2,848 |
| No. 5 shaft | Vertical | 6 | — | 4,347 |
| No. 7 (winze, below 2,625-foot level) | Vertical | 3 | — | 4,323 |
| 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 | — | 2,437 |
| MOUNT NICKEL (inactive) | | | | |
| Mount Nickel shaft | Vertical | 3 | — | 327 |
| HARDY | | | | |
| Hardy shaft | Vertical | 3 | — | 1,427 |
| No. 1125 (winze, below 1,000-foot level) | 36½° | — | — | 1,138 |
| BOUNDARY | | | | |
| Boundary shaft (internal, below Hardy 1,000-foot level) | Vertical | 3 | — | 1,951 |
| ONAPING | | | | |
| No. 1 shaft | Vertical | 5 | — | 3,148 |
| FECUNIS LAKE | | | | |
| No. 1 shaft | Vertical | 6 | — | 4,183 |
| No. 2 shaft | Vertical | 4 | — | 3,243 |
| LONGVACK | | | | |
| Longvack shaft | 17½° | 2 | — | 257 |
| STRATHCONA | | | | |
| No. 1 shaft | Vertical | 4 | 2,150 | 2,196 |

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FALCONBRIDGE MINE

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

During the year a total of 6,281 feet of drifting, 2,471 feet of crosscutting, and 2,771 feet of raising was completed. Total development footage to 31 December 1961 was as follows: 187,495 feet of drifts; 43,127 feet of crosscuts; 102,488 feet of raises. A total of 304 diamond-drillholes, totalling 26,951 feet, were completed in 1961 from underground.

New equipment added was as follows:

- 1 mine fan, on 1,200-foot level, (84-in. axial, Canadian Blower and Forge).
- 9 side-dump cars (137 cu. ft., Robert Hudson Ltd.).
- 1 rocker shovel (Eimco No. 40H, Mine Equipment Co.).
- 1 battery locomotive (75-DS-24-54-B, Goodman Mfg. Co.).
- 1 drill-steel sharpener (550-B, Canadian Ingersoll-Rand).
- 1 gunite machine (Ridley, Lecky Mach. Ltd.).

A total of 763,646 tons of ore was hoisted and milled. The average number of employees was 902: 690 underground, and 212 on surface. R. R. Holmes was mine superintendent.

EAST MINE

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

During the year, 3,227 feet of drifting, 32 feet of crosscutting, and 1,245 feet of raising was completed. Total development footage to 31 December 1961 was as follows: 30,291 feet of drifts; 6,679 feet of crosscuts; 13,947 feet of raises. Some 182 diamond-drillholes, totalling 8,206 feet, were drilled from underground in 1961.

New construction consisted of a tailings-fill storage tank (wood, 20-ft. diameter, 30 ft. high, on concrete foundation, wood-frame housing, asbestos siding, and roll roofing).

Three diesel locomotives (one 38 hp., two 23 hp., Hunslet Locomotive Co.) and 18 Granby cars (eight 60-cu. ft., ten 80-cu. ft.) were added underground equipment.

A total of 280,919 tons of ore was hoisted and milled.

The average number of employees was 150: 138 underground, and 12 on surface. M. J. Chesser was mine superintendent.

McKIM MINE

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

There was no development work completed in 1961. Total development footage to 31 December 1961 was as follows: drifts, 13,540 feet; crosscuts, 9,937 feet; raises, 10,387 feet. In 1961, some 16 diamond-drillholes, totalling 4,347 feet, were completed from underground and 5 holes, totalling 1,472 feet, from surface.

A total of 112,657 tons of ore was hoisted; 113,852 tons was shipped.

The average number of employees was 89: 70 underground, and 19 on surface. J. A. MacMillan was mine superintendent.

HARDY MINE

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

During the year, 95 feet of drifting was completed. Total development footage to 31 December 1961 was as follows: 14,893 feet of drifts; 17,882 feet of crosscuts; 12,912 feet of raises. Diamond-drilling in 1961 consisted of 29 holes, totalling 3,826 feet, from underground.

New equipment added included a wagon-drill mounting (JHM, Canadian Ingersoll-Rand).

A total of 342,337 tons of ore was hoisted; 339,797 tons was milled.

The average number of employees at the mine and concentrator was 337: 133 underground, and 204 on surface. J. Bardswich was mine superintendent.

BOUNDARY MINE

The property consists of one claim in Levack township, District of Sudbury. The mine address is Onaping.

During the year, 1,965 feet of drifting, 572 feet of crosscutting, and 692 feet of raising was completed. Total development footage to 31 December 1961 was as follows: 9,535 feet of drifts; 2,658 feet of crosscuts; 1,252 feet of raises. Some 58 diamond-drillholes, totalling 7,669 feet, were completed from underground.

A total of 57,467 tons of ore was hoisted and milled.

The average number of employees was 37: 36 underground, and 1 on surface. J. Bardswich was mine superintendent.

ONAPING MINE

The property consists of one and one-half claims, in Levack township, District of Sudbury. The mine address is Onaping.

During the year, 1,673 feet of drifting, 166 feet of crosscutting, and 2,005 feet of raising was completed. Total development footage to 31 December 1961 was as follows: 7,185 feet of drifts; 8,238 feet of crosscuts; 3,779 feet of raises. Some 107 diamond-drillholes, totalling 18,821 feet, were completed in 1961 from underground.

A total of 72,012 tons of ore was hoisted; 71,571 tons was milled.

The average number of employees was 87: 59 underground, and 28 on surface. J. Bardswich was mine superintendent.

LONGVACK MINE

The property consists of four claims in Levack township, District of Sudbury. The mine address is Onaping.

During the year, 82 feet of drifting and 77 feet of raising was completed. Total development footage to 31 December 1961 was as follows: 4,813 feet of drifts; 1,186 feet of crosscuts; 3,088 feet of raises. During 1961, 3 diamond-drillholes, totalling 171 feet, were drilled from underground and 26 holes, totalling 15,827 feet, from surface.

A total of 69,406 tons of ore was hoisted; 140,675 tons was delivered for milling.

The operation of the mine was contracted to Temiskaming Inspiration, who employed an average of 60 men: 17 underground, and 43 on surface. E. N. Gilje was mine superintendent, and the company supplied 2 men.

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FECUNIS LAKE MINE

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

During the year, 657 feet of drifting and 331 feet of raising was completed. Total development footage to 31 December 1961 was as follows: 17,155 feet of drifts; 13,423 feet of crosscuts; 12,386 feet of raises. In 1961, some 74 diamond-drillholes, totalling 9,110 feet, were drilled from underground.

New underground equipment included a dust collector (10,000 cfm., Wheelabrator Corp.), located at the crusher station.

A total of 751,394 tons of ore was hoisted; 753,181 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 172: 30 underground, and 142 on surface. E. N. Gilje was mine superintendent.

STRATHCONA MINE

The property consists of five claims, located in Levack township, District of Sudbury. The mine address is Onaping.

The vertical, four-compartment No. 1 shaft, located in the south half of lot 4, concession 4, Levack township, was sunk 2,150 feet in 1961 to a total depth of 2,196 feet below surface. The 300-, 600-, 900-, 1,225-, 1,350-, 1,475-, 1,600-, 1,750-, 1,875-, 2,000-, and 2,125-foot levels were established. Development work consisted of 697 feet of crosscutting, which was also the accumulated total to 31 December 1961.

The shaft sinking was on contract to McIsaacs Mining and Tunnelling, who employed an average of 27 men: 15 underground, and 12 on surface. Clarence Beaton was shaft captain. A. M. Clarke, senior mine geologist, was in charge for Falconbridge, who supplied an additional 8 men.

OUTSIDE EXPLORATION

Outside exploration on Sudbury Basin properties included 75 diamond-drillholes, totalling 117,382 feet, from surface and 1 hole, totalling 4,853 feet, from underground. The following development footage was completed in 1961 from the 2,650-foot level of the Levack mine of International Nickel Company of Canada Limited: drifting, 844 feet; crosscutting, 79 feet; raising, 70 feet. Total development footage in this area to 31 December 1961 was as follows: drifts, 1,213 feet; crosscuts, 133 feet; raises, 129 feet. A further 83 feet of drifting was done from the 3,600-foot level of the Fecunis mine.

A diamond core-drill (No. 50, with jack-knife derrick, Joy Mfg. Co.) was added new equipment.

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

FALCONBRIDGE ROCKHOUSE CONCENTRATOR

New equipment included the installation of pyrrhotite regrind and re-treatment facilities consisting of a mill (10.5 x 10 x 9 ft.), cyclone classifiers, magnetic separators, pumps etc., and a flotation machine (1-4 cell, Denver Equipment Co.).

During the year a total of 1,080,762 tons of ore was milled, producing 158,894 tons of concentrate.

H. T. Berry was plant superintendent.

HARDY CONCENTRATOR

New equipment installed was for a concentrate regrind and retreatment circuit as follows; a pebble mill (Hardinge Tricone, 10.5 x 10 x 9 ft., grate discharge); 8 flotation cells (Denver No. 30); 6 flotation cells (Denver No. 24); 4 magnetic separators (Jeffrey No. 551, countercurrent).

During the year a total of 534,820 tons of ore was milled, and 99,167 tons of concentrate was produced.

Stan. McQuitty was mill superintendent.

FECUNIS CONCENTRATOR

A new pyrrhotite retreatment circuit was installed, comprising the following: 1 ball mill (Dominion, 10.5 x 13 ft., and accessories); 2 wet magnetic separators (Jeffrey, 36 x 51 in.); 2 separators (Dings Crockett, 48 in.); 20 flotation cells (Wemco No. 66); 8 flotation cells (Denver No. 30, sub A); a jaw-crusher (Traylor, 48 x 36 in.); and a conveyor (30-in.) in a new crusher installation.

During the year a total of 827,871 tons of ore was milled, and 129,588 tons of concentrate was produced.

K. C. Mott was mill superintendent.

FALCONBRIDGE SMELTER AND PLANTS

New construction in 1961 included a pyrrhotite pilot plant (Cottrell, 50.5 x 53.3 x 56.9 ft.), with all equipment necessary to expand to 300-500 tons per day, including a parallel-flow dryer (Ruggles-Coles) for the iron product; an extension to the power house (52 x 24 x 30 ft.) and installation of a centrifugal blower (Daniel Adamson, 20,000 cfm. at 7 psi.); and two extensions to the sinter plant (23.2 x 7.7 ft. and 18.2 x 18.3 x 23 ft.) for feed preparation with the installation of pug mill, pelletizing drums, conveyors, etc.

The smelter treated concentrates from the Falconbridge, Hardy, and Fecunis concentrators, producing 70,118 tons of nickel matte.

The average number of employees was 1,142.

H. T. Berry was general superintendent.

The following is taken from the company's annual report for the year ending 31 December 1961:

Mines

| | 1961 | 1960 |
|---|-----------|-----------|
| Ore delivered to treatment plants from company mines tons | 2,531,933 | 2,429,803 |
| Development advances feet | 26,070 | 19,736 |
| Diamond-drilling feet | 195,314 | 117,972 |

Deliveries of ore from company mines were slightly higher than in any previous year. This ore was obtained from the company's mines located on the north and south rims of the Sudbury Basin. The north rim group consists of the Hardy, Boundary, Onaping, Longvack, and Fecunis mines; the south rim group consists of the Falconbridge, East, and McKim mines. The newer mines of the north rim, as in recent years, provided the greater part of the company's production.

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Operations were completed at the McKim and Longvack mines except for backfilling some of the lower level stopes at the McKim. Diamond-drilling has indicated a new orebody at moderate depths in the Longvack area comparable in grade to the original Longvack mine. Equipment has been removed from the mines for use in other locations.

With regard to the Boundary mine, an agreement was made with International Nickel Company of Canada Limited whereby an ore exchange, in a limited area, between the companies avoids loss of ore in party walls. That part of the orebody acquired by the company on the exchange was prepared for mining. At the same time the Onaping mine was prepared for production, as was also a large lens of ore, which was discovered last year a short distance southeast of the Boundary shaft. The Boundary and Onaping mines are in a single ore occurrence, the former in the upper part and the latter in the lower part. For more efficient operations the ore from the Boundary portion will be brought to surface by way of the Boundary winze and the Hardy shaft, and the ore from the Onaping mine will be hoisted through the Onaping shaft. In future, the combined operation will be referred to as the Onaping mine.

Norduna Mines Limited (See page 106)

This company, in which Falconbridge holds a 50 percent interest, owns the Emtwo mine, located a short distance from the main Falconbridge mine. Deliveries of ore from the Emtwo mine to Falconbridge during 1961 were slightly more than 100,000 tons. The orebody was mined out above the 700-foot level. It was then decided to deepen one more level in order to mine a small quantity of ore below the 700-foot level. Crosscutting from the shaft to the orebody had been completed, and drifting in the ore was underway at the year's end.

Treatment Plants

| | 1961 | 1960 |
|---|-----------|-----------|
| Ore delivered to treatment plans from all sources..... tons | 2,639,897 | 2,579,419 |
| Ore milled to produce concentrate..... tons | 2,443,453 | 2,362,463 |
| Ores and concentrates smelted..... tons | 588,177 | 591,190 |

Additional regrind equipment and magnetic separators were installed in the company's three mills to improve recovery and to raise the concentrate grade to the smelter. Additions to the pyrrhotite plant to double the capacity were ready for operating at the year's end. After further improvements in facilities for feeding the sinter plant, full-scale tests in the blast furnace were in progress at the year's end with all-sinter feed.

Ore Reserves

SUMMARY OF ORE RESERVES AT THE YEAR'S END

| | Ore | Nickel | Copper |
|--|------------|---------|---------|
| | tons | percent | percent |
| Developed ore: Falconbridge, East, Hardy, Fecunis, Onaping, and Boundary mines..... | 20,218,400 | 1.63 | 0.84 |
| Indicated ore: Sudbury district..... | 26,028,800 | 1.31 | 0.77 |
| Total..... | 46,247,200 | 1.45 | 0.80 |

During 1961 about 2,500,000 tons of ore was extracted from company mines. However, development and exploration results during the year provided, at the year's end, total reserves about the same as at 31 December 1960. Ore tonnages stood at a slightly higher level, but the nickel and copper content of the reserves was slightly lower. Developed ore reserves decreased by 728,400 tons, and indicated ore increased by 886,500 tons.

Research

Metallurgical research activities were continued in the company laboratories at Falconbridge and Richvale, Ontario, and at Kristiansand, Norway. Experimental development for treatment of lateritic nickel ores was carried on in a pilot plant in the Dominican Republic during the year.

Progress was made in converting all three concentrators in the Sudbury District to an all-milling flow sheet incorporating pyrrhotite separation, in development of autogenous grinding techniques, and in improvement of the pyrrhotite treatment process. At the Richvale and Norwegian laboratories more attention was given to studies of improvements in, and control of, quality of products.

During the year increased emphasis was given to research relating to mining practices applicable to the Sudbury District.

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 of which 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 property consists of sixty-four claims in the Manitouwadge Lake area, District of Thunder Bay.

Mining and milling continued throughout 1961.

SHAFTS, GECO MINE

| Shaft | Claim No. | Inclination | Number of Compartments | Total Depth from Surface |
|---|-----------|-------------|------------------------|--------------------------|
| No. 1 | T.B.46849 | Vertical | 5 | feet 2,373 |
| 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 following development work was done during the year: drifting and crosscutting, 26,816 feet; raising, 11,927 feet. The total development footage to 31 December 1961 was as follows: drifts and crosscuts, 127,937 feet; raises, 39,447 feet. Diamond-drilling consisted of two holes, totalling 1,001 feet, from surface and 448 holes, totalling 102,712 feet, from underground.

New construction in 1961 consisted of a quarry garage (62 by 42 ft., steel frame, asbestos siding).

New equipment added was as follows:

- 1 normal duty box-car loader (24-in., Stephens-Adamson Mfg. Co. Ltd.).
- 1 horizontal belt-conveyor (48-in., Jeffrey Manufacturing Co. Ltd.).
- 1 single-compartment loading-pocket (Dorr-Oliver-Long Ltd.).
- 1 mine-air heater fan (Sheldons Engineering Ltd.).
- 1 overhead crane (20-ton capacity, J. T. Hepburn Ltd.).
- 1 jaw crusher (60- x 48-in., Canadian Allis-Chalmers Ltd.).
- 1 motor (200-hp., Canadian Allis-Chalmers Ltd.).
- 1 feeder (Ross 9-B, Dorr-Oliver-Long Ltd.).
- 1 belt conveyor (36-in., inclined troughed, Jeffrey Manufacturing Co. Ltd.).
- 1 belt conveyor (48-in., Picking, Jeffrey Manufacturing Co. Ltd.).
- 1 crawler crane (Bucyrus-Erie 22B., W. G. Hall Equipment Ltd.).
- 20 mine cars (Hudson, 60-cu. ft., Robert Hudson Ltd.).
- 1 mechanical loader (Atlas Copco Ltd.).
- 2 battery locomotives (Mancha Titan, Mancha Locomotive Division).
- 1 joy slusher and scraper (42-in. Joy Manufacturing Ltd.).
- 2 outdoor switchgear units (Northern Electric Co. Ltd.).
- 4 portable mine power centres (Canadian Westinghouse Ltd.).
- 3 vibrating feeders (60- x 84-in., Jeffrey Manufacturing Co. Ltd.).
- 1 motor pump (½ MRV, Canadian Ingersoll-Rand Co. Ltd.).
- 1 vibrating feeder (48- x 84-in., Jeffrey Manufacturing Co. Ltd.).

The following is taken from the mine manager's report for the year ending 31 December 1961:

Milling

The mill operated 96.65 percent of the total possible time during the year, and averaged 3,498 tons per day as compared with 3,535, tons per day in 1960.

A circuit for the recovery of lead concentrates was placed in operation in July and operated almost continuously for the remainder of the year. Installations for the recovery of mill sands for mine backfill were completed.

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There were no specific metallurgical problems, but research towards reduction of reagent costs was continued throughout the year.

Metal recoveries for the year averaged:

| | Percent |
|-------------|---------|
| Copper..... | 94.32 |
| Silver..... | 78.54 |
| Zinc..... | 82.40 |

Production

| | 1961 | 1960 |
|--|------------|------------|
| ORE MILLED.....dry tons | 1,276,778 | 1,294,077 |
| Calculated Grade: | | |
| Copper.....percent | 1.54 | 1.76 |
| Zinc.....percent | 3.99 | 2.74 |
| Silver.....oz. per ton | 1.52 | 1.36 |
| Gold.....oz. per ton | trace | trace |
| COPPER CONCENTRATE PRODUCED.....dry tons | 67,551 | 77,424 |
| Grade: | | |
| Copper.....percent | 27.43 | 28.11 |
| Silver.....oz. per ton | 21.79 | 17.97 |
| Gold.....oz. per ton | 0.065 | 0.065 |
| ZINC CONCENTRATE PRODUCED.....dry tons | 77,379 | 51,984 |
| Grade: | | |
| Zinc.....percent | 54.29 | 54.56 |
| LEAD CONCENTRATE PRODUCED.....dry tons | 788 | — |
| Grade: | | |
| Lead.....percent | 51.07 | — |
| Silver.....oz. per ton | 69.85 | — |
| Copper.....percent | 4.63 | — |
| REVENUE METAL IN ABOVE CONCENTRATES | | |
| Copper.....lb. | 37,131,892 | 43,522,634 |
| Zinc.....lb. | 84,010,507 | 56,723,451 |
| Lead.....lb. | 805,140 | — |
| Silver.....oz. | 1,526,976 | 1,391,177 |
| Gold.....oz. | 4,405 | 5,071 |

Copper concentrates produced were shipped to the Noranda smelter. Some 33,513 dry tons of zinc concentrates were shipped to a smelter in the United States; 12 cargoes, totalling 35,978 tons, were shipped to Europe; and 670 tons were shipped to Noranda for testing purposes. The available portion of the zinc concentrate stockpile was all shipped by October, but by the end of the year this stockpile was rebuilt to 15,636 dry tons containing 16,897,387 pounds of zinc. Lead concentrates were shipped to a smelter in the western United States.

Mining

The most important development program for the year was directed towards completion of No. 1 shaft extension from the 1,450-foot to the 2,450-foot level, and of the No. 3 crusher complex. The shaft extension was seriously hampered by weak ground conditions, and scheduled completion was retarded by several months. Some 7,600 cubic yards of concrete were placed in the shaft and shaft stations. At the end of the year there was about 100 feet to be finished. The complex of ore- and waste-passes, designed to feed the No. 3 crusher and deliver crushed ore to the main shaft, was well in hand by the end of the year.

A moderate amount of exploration driving was done on the lower levels east of No. 3 shaft. However, the bottom level at the 2,450-foot horizon was advanced east to a position 2,900 feet from No. 3 shaft. Diamond-drilling from this level was incomplete at the end of the year, but information to date confirms the continuation of the main ore zone as projected.

Pattern diamond-drilling was carried out, mainly on the new levels and sublevels below the 1,250-foot level. About 1,000 feet of shallow surface diamond-drilling was completed for assessment purposes on an additional group of six claims staked contiguous to the extreme east end of the property.

Excavation for the permanent ventilation system, both for fresh-air and return-air service, was advanced throughout the year.

Stope preparation was carried out at a rapid rate in all stoping blocks, but 75 percent of the work was in the area east of No. 1 shaft, all the way from No. 550 sublevel down to the 1,650-foot level. Stope-preparation headings accounted for 60 percent of the advance in the mine for the year.

In the B block of stopes immediately west of No. 1 shaft, pillar failures at the beginning of the year necessitated a reschedule of mill-feed sources. This accounts for the reduction in mill-head

grade and tonnage experience as compared with 1960. In this problem area, a recovery method was devised that involved the introduction of coarse quarried backfill from surface, and some additional preparation, followed in turn by a major pillar blast. This work culminated in a 400,000-ton shot at the end of August, and operations since have indicated its success. Another major pillar blast was undertaken at the end of the year in the original A zone to the west, and the excavation in that area is now continuous from surface to a depth of 550 feet. Ore production for the year was 91 percent from blasthole stoping and 9 percent from stope preparation.

During the year, 136,500 tons of waste was hoisted, 25,000 rockbolts were placed, and 186,000 solid cubic yards of quarry fill was placed.

Ore Reserves

Regular pattern diamond-drilling was completed in only a part of the orebody lying above the 2,100-foot horizon. Based on these results, ore reserves are estimated as follows:

| | Ore | Copper | Zinc | Silver |
|--------------------------------------|------------|---------|---------|--------|
| | tons | percent | percent | ounces |
| Total and average for 1961 | 18,269,000 | 1.94 | 4.23 | 2.32 |
| Total and average for 1960 | 17,429,000 | 1.97 | 4.18 | 2.20 |

Grades and tonnages quoted include an allowance for dilution of 10 percent. The prices for metals used to evaluate for ore purposes were:

| | | |
|------------------|---------|-------------------|
| | | Canadian Funds |
| Copper | per lb. | \$ 0.30 |
| Zinc | per lb. | 0.11 |
| Silver | per oz. | 0.90 |
| Gold | per oz. | 35.00 |

The average number of employees was 572: 252 underground, and 320 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; 29,357,792 shares have been issued.

The officers of the company in 1961 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; T. M. Gaetz, general manager (Ontario division); W. A. McCadden, comptroller; W. F. Kennedy, secretary; F. M. A. Noblet, treasurer; Frederic Benard, assistant general manager (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); J. H. Tuck, manager (nickel-refining division, Port Colborne).

The executive office is at 67 Wall Street, New York 5, N.Y., U.S.A., and the general offices are at Copper Cliff. The Toronto office is at 55 Yonge Street, Toronto 1.

The company and its subsidiary companies operate: hydro-electric plants 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; at Huntington, West Virginia, U.S.A.; and at Glasgow, Scotland; and a foundry at

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Bayonne, New Jersey, U.S.A. In 1961 the company's new nickel mining, smelting, and refining project at Thompson, Manitoba, was completed and brought into full operation, thereby increasing the nickel production capacity to more than 385,000,000 pounds per year.

The company employed, in Ontario, excluding employees of contractors, an average of 19,075 persons: at mines, 6,945 underground, and 1,974 on surface; at concentrators, smelters, refineries, and iron ore recovery plants, 10,156.

SHAFTS, INTERNATIONAL NICKEL COMPANY'S MINES, SUDBURY AREA

| | Inclination | Number of Compartments | Sinking in 1961 | Total Depth from Surface feet |
|--|-----------------------------------|---|-----------------|----------------------------------|
| CREAN HILL | | | | |
| No. 1 shaft..... | 57° to 305 ft. 71° to bottom | 3 | — | 797 |
| No. 2 shaft..... | | 5 | — | 2,115 |
| CREIGHTON⁽¹⁾ | | | | |
| No. 2.0 shaft..... | 65° | 2 | — | 314 |
| No. 3 shaft..... | 55° | 5 | — | 1,946 |
| No. 4 shaft (internal collared at 1,477-foot depth) ⁽¹⁾ | 50° | 5 | — | 2,702 |
| No. 5 shaft..... | Vertical | 6 | — | 4,074 |
| No. 6 shaft (internal, collared at 3,822-foot depth)..... | Vertical | 5 | — | 5,562 |
| No. 7 shaft..... | Vertical | 3 | — | 2,056 |
| No. 65 winze (collared at 3,819-foot depth) ⁽²⁾ | 65° 30' | 3 | — | 4,320 |
| No. 8 shaft (internal, collared at 5,017-foot depth)..... | Vertical | 3 | — | 6,746 |
| FROOD-STOBIE | | | | |
| No. 1 shaft ⁽³⁾ | 77° to 1,300 ft. 61° to bottom | 2 | — | 3,097 |
| No. 3 shaft..... | | 6 | — | 3,040 |
| No. 4 shaft ⁽⁴⁾ | Vertical | 3 | — | 3,928 |
| No. 6 shaft (internal, collared at 2,872-foot depth)..... | Vertical | 3 | — | 3,391 |
| No. 7 shaft..... | Vertical | 5 | — | 3,105 |
| No. 8 shaft..... | Vertical | 3 | — | 2,624 |
| GARSON | | | | |
| No. 1 shaft ⁽⁵⁾ | Vertical | 3 | — | 1,457 |
| No. 2 shaft..... | Vertical | 5 | — | 4,243 |
| No. 3 shaft (internal, collared at 4,000-foot depth)..... | Vertical | 2 | 957 | 5,014 |
| LEVACK | | | | |
| No. 1 shaft ⁽²⁾ | 65° | 3 | — | 983 |
| No. 2 shaft..... | Vertical | 6 to 2,910 ft. 5 to 2,973 ft. 4 to bottom | — | 3,915 |
| No. 3 shaft (internal, collared at 1,594-foot depth)..... | Vertical | | 3 | — |
| MURRAY | | | | |
| No. 1 shaft ⁽⁶⁾ | 36° | 3 | — | 593 |
| No. 1 winze (collared at 470-foot depth) ⁽⁶⁾ | 36° | 2 | — | 775 |
| No. 2 shaft..... | Vertical | 5 | — | 3,298 |
| VICTOR | | | | |
| No. 1..... | Vertical | 3 | — | 362 |
| COPPER CLIFF NORTH | | | | |
| No. 1..... | Vertical | 5 | — | 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 from 1 January to 31 March, 1961, after which the mine was closed for an indefinite period. The mine was being kept dewatered and the plant being maintained to provide services for the Ellen pit.

Development work consisted of 1,688 feet of drifting and crosscutting, and 1,041 feet of raising. Total development footage to 31 December 1961 was as follows: 48,525 feet of drifts and crosscuts; 12,554 feet of raises. Diamond-drilling in 1961 consisted of 43 holes, totalling 25,055 feet, from underground.

New equipment added included the following:

- 2 batteries (66 type D85 cells, Electric Storage Battery Co., Toronto).
- 1 mine fresh-air heating and heat recuperation system (Calorific Ltd. Toronto).
- 1 pump (DVMX, 3 x 4 x 90 in., Byron Jackson Canada Ltd., Toronto).
- 6 air winches (Hyla, Holman Bros. (Canada) Ltd., Kitchener).
- 10 hoists (D6V, Canadian Ingersoll-Rand, Montreal).

The contractor employed an average of 36 men: 28 underground, and 8 on surface. R. H. Brown was superintendent for International Nickel, and the company supplied a further 4 men.

CREIGHTON MINE

Operations continued throughout the year.

Development work during the year consisted of 11,259 feet of drifting and crosscutting; 2,654 feet of raising. Total development footage to 31 December 1961 was as follows: 410,292 feet of drifts and crosscuts; 201,493 feet of raises. A total of 143 diamond-drillholes, totalling 64,508 feet, were completed in 1961 from underground.

New equipment included the following:

- 4 batteries (66 type D8 cells, Amalgamated Electric Corp.).
- 3 rectifiers (silicon battery charging, type KC-17, Northern Electric).
- 1 loading machine (for 24 in. track, Atlas Copco.).
- 1 pump (Deepwell Turbine, 15-stage, Byron Jackson Canada Ltd.).
- 1 fan (axial-flow, 72-in., Super B, Canadian Blower Forge).
- 1 loading machine (Blu-Rox model S-753, Tenance Tools Ltd.).
- 20 Granby cars (110-cu. ft., Dorr-Oliver-Long).
- 2 locomotives (type 75D-24-44B, Coveman Mfg. Co., Chicago, U.S.A.).

A total of 4,483,422 tons of ore was hoisted and shipped for treatment.

The average number of employees was 2,018: 1,498 underground, and 520 on surface. E. E. Mumford was superintendent.

FROOD STOBIE MINE and FROOD OPEN PIT

Operations continued throughout the year.

Development work during the year consisted of 14,840 feet of drifting and crosscutting; 6,927 feet of raising. Total development footage to 31 December 1961 was as follows: 503,599 feet of drifts and crosscuts; 196,738 feet of raises. Some 35 diamond-drillholes, totalling 6,739 feet, were drilled from underground in 1961.

New equipment added included:

- 15 tippie cars (260 cu. ft., National Steel Car Corp.).
- 30 Granby cars (110 cu. ft., Dorr-Oliver-Long).
- 2 loading machines (Blu-Rox, model S753, Tenance Tools Ltd.).
- 1 electric welder (SAE 400, spec. 7046, Lincoln Electric Co.).
- 1 battery (92-cell, T125LA6/6, Amalgamated Electric Corp.).
- 2 rectifiers (silicon, battery charging, Kingston Lee Watson Co.).

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A total of 5,614,371 tons of ore was hoisted and shipped for further treatment.

The average number of employees was 3,006: 2,366 underground, and 640 on surface. S. J. Sheehan was superintendent.

Work in the Froid open pit was terminated at the end of May after 23 years of operation. The service shops are continuing to operate, although much of the equipment has been transferred to the Clarabelle open pit.

A total of 403,762 tons of ore was mined in the open pit and trucked to the rockhouse.

The average number of employees was 118: 32 in the open pit, and 86 on surface. N. A. Creet was superintendent.

GARSON MINE

Operations continued throughout the year.

No. 3, vertical, two-compartment internal shaft, collared at a depth of 4,000 feet, was sunk 957 feet to a total depth of 5,014 feet below surface. The 4,200-, 4,400-, 4,600-, 4,800-, and 5,000-foot levels were established at depths of 200, 399, 599, 798, and 998 feet, respectively, below the collar.

Development work during the year consisted of 1,617 feet of drifting and crosscutting; 4,165 feet of raising. Total development footage to 31 December 1961 was as follows: 218,471 feet of drifts and crosscuts; 95,097 feet of raises. A total of 1,039 feet of drifting and crosscutting was completed on the 1,400-foot level of the Falconbridge East mine. Some 131 diamond-drillholes, totalling 39,554 feet, were drilled from underground in 1961; this included 22 holes, totalling 1,572 feet, drilled at the Falconbridge East mine.

A total of 1,191,215 tons of ore was hoisted and shipped for further treatment.

The average number of employees was 1,078: 896 underground, and 182 on surface. B. T. King was superintendent.

LEVACK MINE

Operations continued throughout the year.

The 2,200-foot level in No. 2 shaft was established 2,210 feet below the collar.

Development work in 1961 consisted of 5,953 feet of drifting and crosscutting; 3,623 feet of raising. Total development footage to December 1961 was as follows: 246,972 feet of drifts and crosscuts; 76,525 feet of raises. Some 200 diamond-drillholes, totalling 63,032 feet, were drilled from underground in 1961.

New equipment included the following:

- 1 battery (station, 92-cell, T-125/LR4/6, Amalgamated Electric Co., Toronto).
- 1 boiler (Scotch Dry Back, CL-20, 15 psi., Dominion Bridge, Toronto).

A total of 2,181,789 tons of ore was hoisted and shipped for further treatment.

The average number of employees was 1,924: 1,575 underground, and 349 on surface. V. H. Ritzel replaced F. M. McAteer as superintendent.

MURRAY MINE

Operations continued throughout the year.

Development work in 1961 included 4,879 feet of drifting and crosscutting; 1,683 feet of raising. Total development footage to 31 December 1961 was as follows: 170,382 feet of drifts and crosscuts; 37,588 feet of raises. In 1961, some

19 diamond-drillholes, totalling 5,265 feet, were drilled from underground, and 5 holes, totalling 1,889 feet, were drilled from surface.

Added equipment was as follows:

- 1 hoist (single-drum electric, 8 ft x 54 ins., John Bertram and Sons, Dundas).
- 1 hoist motor (1,000 hp. Type HW, Canadian Westinghouse, Toronto).
- 1 iron worker (No. 16N universal, J. E. Rumball, Sudbury).

A total of 1,848,301 tons of ore was hoisted and shipped for further treatment.

The average number of employees was 663: 518 underground, and 145 on surface. H. W. Smith was superintendent.

ELLEN OPEN PIT

Work at the Ellen open pit continued throughout 1961. The pit, located about 2 miles east of the Crean Hill mine, commenced ore production averaging 1,500 tons daily early in 1961. The ore is trucked to the primary crusher on surface at the Crean Hill mine and after crushing is transported by railway to the Copper Cliff concentrator.

Churn-drilling for ore production consisted of 227 holes, totalling 13,164 feet. A total of 312,485 tons of ore was mined and treated.

The average number of employees was 59: 29 in the pit, and 30 on surface. R. H. Brown was superintendent.

CLARABELLE OPEN PIT

Operations at the Clarabelle open pit, located between Copper Cliff and the Murray mine, made progress during the period from 1 November to 31 December, 1961. Stripping of the orebody by the contractor and later by International Nickel was continuing.

New construction completed in 1961 consisted of the following: service garage, shops, and warehouse (one storey, 216.8 x 77.3 x 22.5 ft.); primary crushing plant (one storey, 93 x 45 x 48.5 ft.); conveyor gallery and take-up house (226.5 x 14 x 8.5 ft.). The construction consisted chiefly of reinforced concrete floors on fill, concrete walls below grade, and Corr asbestos siding and Corr translucent panels above grade, with roof of precast Haydite slabs and 20-year bonded tar and gravel roofing.

New equipment installed included the following:

- 1 dust collector (No. 10, model 126, Wheelabrator Corp., Scarborough).
- 1 hydraulic system including jack assembly etc. (Canadian Vickers, Montreal).
- 1 electric welder (SAE 400, spec. S-7046, Lincoln Electric Co. of Canada, Leaside).
- 1 electric hoist (Huk 30/3/1, 10,000 lb., John Bertram & Sons, Dundas).

Some 426 churn-drillholes, totalling 17,463 feet, were drilled for production purposes. A total of 73,005 tons of ore was mined and trucked to the rockhouse, at an average of 1,718 tons daily during the period of operation.

The average number of employees, excluding men employed by the contractor, was 53: 31 in the pit, and 22 on surface. N. A. Creet was superintendent.

COPPER CLIFF NORTH MINE

The sinking of the vertical, five-compartment No. 1 shaft was commenced on contract, and 50 feet had been completed in 1960. The dimensions inside the concrete lining will be 18 by 14.5 feet, and the depth objective is 3,000 feet. The surface plant was completed in 1961 in readiness for further sinking in 1962.

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New construction completed included the following:

- Hoist and compressor house (one storey, 140 x 54 x 32 ft.).
- Office and change-house (one storey, 122 x 102 x 17.8 ft.).
- Secondary crushing plant (three storeys, 95 x 45 x 73 ft.).
- Ore storage and rock bins (four storeys, 57 x 41 x 82 ft.).
- Ore bin (41.3 ft. O.D. by 39.3 ft. high); rock bin (18 ft. O.D. by 22.3 ft. high); both concrete.
- Conveyor gallery—take-up house (345 x 14 x 9 ft.).
- Lady MacDonald pumphouse (one storey, 29 x 20 x 13 ft.).
- Mine water and sewage water pumphouse (one storey, 29 x 21 x 17 ft.).

The construction of the above buildings was very similar to buildings constructed at the Clarabelle open pit.

New equipment installed was as follows:

- 1 crane (electric overhead travelling, 50 ton, series CD-1-TEC, John T. Hepburn, Toronto)
- 1 hoist (electric, 6,600 lb., demag HKK30/2/1, John Bertram and Sons, Dundas).
- 2 boilers (LS-86 Scotch Dry type, 15 psi., Dominion Bridge, Toronto).
- 2 pumps, sewage (Canadian Buffalo 4 x 6, Canada Pumps Ltd., Kitchener).
- 2 tanks, oil storage (5,000 gals., Plate and Structural Steel, Toronto).
- 2 pumps (12 in. K.M., 2-stage DWT, Byron Jackson of Canada, Toronto).
- 1 unit diesel power (Wakesha, model 190 DICU, Byron Jackson of Canada, Toronto).
- 2 motors (50-hp., vertical hollow shaft, Byron Jackson of Canada, Toronto.)
- 1 gas engine (continental model F-226, Worthington (Canada) Ltd., Brantford).
- 1 dust collector (knocked-down type, No. 10 model 126, Wheelabrator Co. of Canada, Scarborough).
- 1 transformer (Zig-Zag grounding, 216 Kva., Ferranti-Packard, Toronto).
- 6 breakers (air circuit, 1,600 amps., Northern Electric Co., Toronto).
- 1 speed reducer (No. 380CD, Hamilton Gear and Machine Co., Toronto).
- 1 motor (150-hp., sp. cage induction, Orenda Industrial Ltd., Rexdale).
- 1 battery (T125/LR6/12, 92 cells, Amalgamated Electric Corp., Toronto).
- 1 hydraulic system, including jack assembly, etc. (Canadian Vickers, Montreal).
- 2 motors (40-hp., hollow shaft, Worthington (Canada) Ltd., Brantford).
- 1 set, fittings and bottom plate assembly for crusher (Traylor Eng. & Mfg. Co., Allentown, Pa., U.S.A.).

LAWSON QUARRY

The quarry is operated to supply quartzite rock, which is used as a flux in Sudbury smelting operations. The quarry address is Willisville.

Some 170 churn-drillholes, totalling 11,728 feet, were drilled for quartzite production in 1961.

A total of 508,034 tons of quartzite was mined and delivered to the rockhouse; 505,836 tons was shipped

The average number of employees was 39. W. G. Tilston was superintendent.

CREIGHTON MILL (CONCENTRATOR)

The Creighton mill treated 3,881,846 tons of ore, averaging 10,635 tons daily, to produce concentrates, which were pumped to the Copper Cliff smelter.

The average number of employees was 102. E. McMullen was superintendent.

COPPER CLIFF CONCENTRATOR

The Copper Cliff concentrator treated 8,967,941 tons of ore, averaging 24,570 tons daily, to produce concentrates.

New equipment installed included the following:

- 26 flotation machines (each of 7 Fagergren cells, 66 x 50 ins., Western Machinery Co. Ltd., Toronto).
- 5 flotation machines (6-cell, No. 30, Denver Equipment Co., of Canada Ltd. Toronto).
- 1 transformer (750 kva., 6900/5754 Maloney Electric Co. of Canada, Toronto).
- 1 transformer (300 kva., Acme Electric Co. Ltd., Toronto).
- 15 pumps (8 x 6 ins., Type SR-LC, Canadian Allis-Chalmers Ltd., Montreal).
- 2 heater-burner blower units (National Champion, Howard Eng. & Sales, Toronto).

J. Lee was superintendent.

LEVACK MILL (CONCENTRATOR)

A total of 2,167,650 tons of ore was milled, at an average of 5,939 tons daily. The average number of employees was 88. G. H. Morrison was superintendent.

CONISTON SMELTER

The Coniston smelter treated 388,318 tons of concentrate, producing 45,089 tons of bessemer matte.

New equipment installed included the following:

- 1 battery (92 type LR4, Nife cells, Amalgamated Electric Corp., Toronto).
- 1 car shakeout (heavy-duty, model HO-126, Hewitt-Robins Can. Ltd., Montreal).

The average number of employees was 641. F. G. Murphy was superintendent.

COPPER CLIFF SMELTER

The production from the smelter was 208,613 tons of nickel matte, 18,645 tons of nickel oxide sinter, and 161,215 tons of converter copper.

New construction consisted of electric-shop extensions comprising additions to the winding shop (40 x 20 x 32 ft.); to the steam cleaning and spray painting room (22 x 12 x 12 ft.); to the paint storage room (12 x 10 x 12 ft.); to the office (15 x 8 x 8 ft.); to the switch and relay room (40 x 40 x 8 ft.); and a three-bay thaw shed (202 x 23 x 16 ft.).

New equipment installed was as follows:

- 1 dust unloading conveying system (Dracco, Mine Equip. Co., Montreal).
- 1 barrel conveying equipment (Jervis B. Webb Co. of Can. Ltd., Hamilton).
- 1 track maintenance machine (model MCTC-2|LPR, Tamper Ltd., Toronto).
- 1 blower (40,000 cfm., Brown Boveri, Montreal).
- 20 ore cars (used) (C.P.R., Montreal).
- 3 roasters (fluosolids systems, CAP, each 250 tons per day, Dorr-Oliver-Long, Orillia).
- 1 traxcavator (Caterpillar No. 955, series H, 1 $\frac{3}{4}$ yds., G. W. Crothers, Ltd., Leaside).
- 2 speed reducers (torque arm, Dodge TDC-15, Dorr-Oliver-Long, Orillia).
- 6 meters (18-in., belt, Transweigh Co., King of Prussia, Pa., U.S.A.).
- 4 scales (barrel, Howe Weightograph, model 1198 T.C.W., Eastern Steel, Toronto).
- 2 scales (barrel, Howe Weightograph, model 1198 T.C.O., Eastern Steel, Toronto).
- 8 hoists (electric, type WKK 20/2/1, Canadian Demac, Toronto).
- 2 hoists (electric, type HKP 35/2/1, Canadian Demac, Toronto).
- 2 hoists (electric, type HKP 50/4/1, Canadian Demac, Toronto).
- 2 samplers (Synder 24-in. Simplex, Denver Equipment (Canada) Ltd., Toronto).
- 3 samplers (Galigher 42-in., Canadian Locomotive Co. Ltd., Kingston).
- 1 sampler (Galigher 24-in., Canadian Locomotive Co. Ltd., Kingston).
- 1 heater (make up air rezhor, DSM 600, Calorific Ltd., Toronto).
- 1 pump (4/3 De Laval single-stage, Combustion Engineering Super Heater Ltd., Montreal).
- 2 pumps (Babcock, 3/4 V-2, 2-stage, Babcock-Wilcox-Goldie and McCulloch, Galt).
- 1 control set, complete (for 40,000 cfm. blower) (Canadian General Electric, Toronto).
- 1 car, motor (Fairmount A-5, series C, Fairmount Railway Motors Ltd., Toronto).
- 1 heater (diesel-fired, cap. per hour 2,000,000 Btu., Calorific Ltd., Toronto).
- 2 nitrogen tanks, regenerators (Horton Steel Works Ltd., Fort Erie).
- 1 rotor (for 90,000 cfm. blower) (Canadian Ingersoll-Rand, Montreal).

The average number of employees at the Copper Cliff concentrator and smelter was 5,914. J. N. Lilley, superintendent of smelters, was in charge.

IRON ORE RECOVERY PLANT

The iron ore recovery plant produced 218,561 tons of iron ore, averaging 599 tons daily.

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Construction was commenced in 1961 on the following:

- Roaster-kiln building addition (7 storeys, 330 x 245 x 126 ft.).
- Ammonia leaching building addition (2 storeys, 322 x 145 x 59 ft.).
- Recovery building addition (3 storeys, 240 x 96 x 73 and 39 ft.).
- Office and change-house addition (1 storey, 134 x 41 x 13 ft.).
- Thickener station and pumphouse:
 - Pumphouse (2 storeys, 75.25 x 22.75 and 44.6 ft.).
 - Thickeners (two 40 ft. diam., 12 ft. high, ¼-in plate, on reinforced concrete foundations).
- Shops building (1 storey, 222 x 82 x 22.5 ft.).
- Warehouse building (1 storey, 142 x 82 x 16 ft.).

The construction of the buildings normally consists of reinforced concrete floors, tile walls, steel framing, precast Haydite slab roofs with 20-year bonded tar and gravel roofing.

New equipment added included the following:

- 1 payloader (Hough H30G, W. L. Ballentine Ltd., Toronto).
- 1 motor (synchronous, 650 kw., WDYK-224, Brown-Boveri Ltd., Montreal).
- 1 mixer (lightning model 519-TELB-503, Gray Mixing Equipment Ltd., Toronto).

The average number of employees was 383. 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 161,215 tons of converter copper and 467 tons of scrap and secondary copper was refined, to produce 154,427 tons of refined copper.

New equipment added included:

- 1 painting machine (Ingersoll Milling Machine Co. Rockford, Ill., U.S.A.).
- 1 crane (7½-ton, Taymar Mark V, Dominion Structural Steel, Montreal).
- 2 conveyor systems (Plessisville, Que.).
- 1 forklift truck with turntable (Automatic Transportation Co., Montreal).
- 1 high-frequency conveyor (20 kw., Type N, Ajax Magnetherm of Canada Ltd., Ajax).

The average number of employees was 880. W. R. Koth was manager.

PORT COLBORNE REFINERY

The Port Colborne refinery produces nickel cathodes, shot, ingots, and oxides; cobalt cathodes; and elemental sulphur.

Pilot-plant facilities were expanded in 1961. The development of processes permitting improved recoveries and greater utilization of the ores was under active investigation in the research stations. A number of plant and process improvements were made.

The average number of employees was 2,148. J. H. Tuck was manager.

The following is taken from the company's annual report for the year ending 31 December 1961:

Mines

Total ore production from the mines in 1961 amounted to 17,489,000 tons, compared with 16,768,000 tons in 1960. The 1961 total covers production from both the Sudbury district mines in Ontario and the Thompson mine in Manitoba.

The operating mines in the Sudbury district increased to seven as two new open-pit mines were added. Initial operations began late in the year at the new Clarabelle open-pit mine north of Copper Cliff, and a smaller open pit was brought into operation at the Ellen mine located in Denison township. The two new mines do not increase the production capacity of the Sudbury district mines, but replace tonnage that had been obtained from other mines.

At the Froid-Stobie mine, ore recovery from the surface was completed during the year, and all mining is now underground.

The use of a mixture of ammonium nitrate and fuel oil as a blasting agent, instead of dynamite, was introduced into the mines during 1961. Its use is expected to result in a reduction in blasting costs.

Ore Reserves

Despite the mining of more than 17,000,000 tons of ore, the proven ore reserves of the company's Sudbury district and Manitoba mines increased during the year, and at 31 December 1961 stood at 297,419,000 tons, with a nickel-copper content of 8,937,300 tons. At the end of the previous year the proven ore reserves stood at 290,273,000 tons, with a nickel-copper content of 8,715,300 tons.

The proven ore reserves of the company, as reported, are blocks of economic ore, which have been explored by drilling or otherwise, in sufficient detail and in accordance with our standard practice, to enable accurate calculation of the tonnage of ore and its nickel-copper content.

Plant and Process Improvements

Construction started early in the year on the company's largest capital project in Canada, expansion of the plant at Copper Cliff for the recovery of high-grade iron ore. Apart from a two-month delay caused by a strike of employees of a construction contractor, the work proceeded satisfactorily. Involving an estimated capital cost of \$50,000,000, the expanded plant will triple the plant's production capacity of high-grade iron ore.

During the year a new fluid-bed roasting plant for the production of nickel oxide sinter was brought into operation at the Copper Cliff smelter, largely replacing an earlier process. Significant advances were also made in the Port Colborne nickel refinery in product improvement and process modifications.

In 1961 the company opened a new research station at Port Colborne for the study of methods for ore processing. Research conducted in this facility resulted in the development of new methods for the extraction of nickel from all types of ores.

In the United Kingdom the refinery at Clydach started using as its feed the product of the new fluid-bed roasting plant at Copper Cliff. The new feed will result in substantial economies in refinery costs. At Acton, a number of plant improvements were made in the platinum refinery as part of a general program for improving the efficiency of refining the platinum metals. The smelting section of the platinum refinery was rebuilt and re-equipped.

Kam-Kotia Porcupine Mines Limited

Kam-Kotia Porcupine Mines Limited was incorporated in August 1932, with an authorized capitalization of 4,000,000 shares of no par value, of which 800,000 shares have been issued. The directors and officers were: A. W. White, president and director; C. H. E. Stewart, 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 1. The mine address is Timmins, P.O. Box 290.

The property consists of ten claims, located in Robb township, Porcupine area, District of Cochrane, about 12 miles northwest of Timmins. Operations in the open pit continued throughout 1961. Diamond-drilling consisted of 27 holes, totalling 3,277 feet, from surface.

The complete mill of Nickel Rim Mines Limited and a major part of the plant of Lake Cinch Mines Limited, North West Territories, was purchased and transferred to the property. The mill operated from 9 April to 31 December, 1961.

New construction in 1961 included the following: a pumphouse (20- x 20-ft.), a cold-storage building (40- x 20-ft.), and an addition to the crusher house (16- x 32-ft.), all frame construction, with plywood siding. Added equipment included: a tractor (D8, Caterpillar-Tractor Co., U.S.A.); 10 flotation cells (Denver 24 Sub A, Denver Equipment Co. Toronto); a truck (2-ton, Ford Motor Co., Oakville); a lathe (6-ft.); an engine lathe (10-ft.).

A total of 601,205 tons of waste was removed from the open pit, and 252,250 tons of ore was mined. The mill treated a total of 235,136 tons, averaging 890 tons daily during the period of operation.

The average number of employees was 85: 17 in the open pit, and 68 on surface. G. W. Walkey was mine manager.

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Nickel Mining and Smelting Corporation

Eastern Mining and Smelting Corporation Limited was incorporated in December 1955. It is an amalgamation of Eastern Smelting and Refining Company Limited and Quebec Nickel Corporation Limited. The name was changed to Nickel Mining and Smelting Corporation, with the authorized capitalization increased to 8,500,000 shares of no par value, of which 5,387,082 shares have been issued. The directors and officers were: A. W. Johnston, president; H. B. Hicks, vice-president and general manager; T. J. Day, W. C. Campbell, Eliot Janeway, and Robert Lafleur, directors; William McKee, secretary; W. M. O'Shaughnessy, treasurer. The head office is at 100 Adelaide Street West, Toronto 1. The mine address is Box 700, Lac du Bonnet, Manitoba.

The company owns the nickel-copper property known as the Gordon Lake mine, previously called the Quebec Nickel mine. The property, consisting of 182 claims, is in the Werner Lake area, District of Kenora (Patricia Portion).

Mining operations continued throughout 1961.

SHAFTS, GORDON LAKE MINE

| Shaft | Claim No. | Inclination | Number of Compartments | Total Depth from Surface |
|--|-------------|-------------|------------------------|--------------------------|
| No. 1 | K.R.L.19096 | Vertical | 3 | feet 360 |
| No. 2 | K.R.L.31831 | Vertical | 3 | 1,707 |
| No. 3 (internal, collared at 1,200-foot depth) | — | Vertical | 2 | 1,683 |

No. 2 shaft was sunk 412 feet to a depth of 1,707 feet below surface. This shaft is about 2,500 feet west of No. 1 shaft and will be the production shaft.

Development footage in 1961 consisted of 3,994 feet of drifting and 272 feet of crosscutting. Total footage to 31 December 1961 was as follows: 17,307 feet of drifts; 7,122 feet of crosscuts; 1,486 feet of raises. Diamond-drilling in 1961 consisted of 182 holes, totalling 14,417 feet, from underground.

Construction was commenced on a 750-ton-per-day concentrator, a new head-frame, hoist-house, power plant addition, bunkhouse, cafeteria, and some new housing; none were completed at the year's end. A double-drum hoist (Canadian Ingersoll-Rand, 72 x 60 in. PE 1) and an oil-fired boiler (Volcano, low-pressure, 150-hp.) had been purchased.

The average number of employees was 19: 2 underground, and 17 on surface. The shaft contractor employed an average of 17 men. 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 1. The mine address is Box 353, Falconbridge.

The property, consisting of two claims located in Falconbridge and Keno-gaming townships, District of Sudbury, is a short distance east of the Falconbridge plant. (See page 94.)

Mining operations continued throughout the year. No. 1, vertical, three-compartment shaft, was sunk 134 feet in 1961 to a total depth of 859 feet below surface. The 850-foot level was established at a depth of 842 feet. During the year, 213 feet of drifting and 360 feet of crosscutting was completed. Total development footage to 31 December 1961 was as follows: 3,830 feet of drifts; 2,092 feet of crosscuts; 907 feet of raises.

A total of 107,964 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 38: 18 underground, and 20 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 shares had been issued. The directors and officers were: W. S. Row, president and director; E. T. Donaldson, L. J. Moreaux, R. V. Porritt, K. C. Gray, K. A. Davis, 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 eighty-one 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 and milling operations continued throughout 1961.

SHAFTS, NORTH COLDSTREAM MINE

| | Claim No. | Inclination | Number of Compartments | Total Depth from Surface |
|----------------------------------|-----------|-------------|------------------------|--------------------------|
| No. 1 shaft ⁽¹⁾ | K.65 | 80° | 2 | feet 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 | 1,596 |

⁽¹⁾Sunk by former operators; not in use. Considerable lateral work was done from No. 1 shaft by former operators.

Development footage in 1961 consisted of 3,353 feet of drifting, 1,523 feet of crosscutting, and 3,423 feet of raising. Total development footage to 31 December 1961 was as follows: 13,353 feet of drifts; 7,876 feet of crosscuts; 10,661 feet of raises. Diamond-drilling in 1961 consisted of 432 holes, totalling 49,367 feet, from underground. New construction in 1961 consisted of a core house, a Rosco building (48 x 18 ft.), to replace the one destroyed by fire in 1961.

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New equipment installed included the following:

- 1 jaw-crusher (C.A.C., 36- x 48-in.).
- 1 grizzly feeder (Locker).
- 2 tailings pumps (A-S-H-B-6-5 with 25-hp. motors).

A total of 332,453 tons of ore was hoisted: 332,783 tons was treated in the mill, which averaged 912 tons daily.

The following is taken from the manager's report for the year ended 31 December 1961:

Developing and Mining

Development work during the year was concentrated mainly on the block of levels between the 800-foot level and the 1,400-foot level. The driving of the ore- and waste-passes from the 1,500 loading-pocket to break through to the existing system below the 800-foot level was completed.

Drifting to the east property boundary on the 950-, 1,100-, 1,250-, and 1,400-foot levels was also completed, and the essential exploratory diamond-drilling has been done.

Between the 1,250- and 1,400-foot levels nothing of economic importance has been disclosed in diamond-drilling, although some narrow, erratic values were intersected. To date no drilling has been done below the 1,400-foot horizon.

Detailed drilling to outline ore below the 800-foot level has been completed, and stoping plans have been drawn up. The main part of this ore will be mined by blast-hole methods, and stope preparation is underway.

The installation of the 36- by 48-inch jaw-crusher, just below the 1,400-foot level, was completed and is operating satisfactorily. All ore and waste is now being hoisted from the 1,500-foot loading-station.

Development work in the upper levels consisted mainly of subdrifts, box-holes, and stope service raises. Some drifting and crosscutting for stope preparation was also carried out.

Ventilation and escapeway raises from the 800-foot level to the 200-foot level were also completed during the year.

A total of 306,870 tons of ore was broken in silling, stoping, and development, and 333,520 tons of ore was trammed. Of the total ore broken, about 30 percent was from blast-hole mining, 61 percent by shrinkage stoping, and the remainder was from development and stope preparation work.

Ore Reserves

Ore reserves at 31 December 1961, after allowing for dilution, were estimated to be 1,558,000 tons, having an average grade of 2.08 percent copper.

A reduction in ore-reserve grade is due to the lower-than-average grade of ore below the 800-foot level, and to the revision downwards in some areas above the 800-foot level, where additional information was obtained in the course of mining and detailed diamond-drilling.

The average number of employees was 234: 115 underground, and 119 on surface. L. R. Redford was manager.

Rio Algom Mines Limited (Pronto Division, Pater Mine)

In June 1960, Pronto Uranium Mines Limited, which controlled the Pater mine, merged with other companies to form Rio Algom Mines Limited. Further details are given in the Uranium section of this report under Rio Algom Mines Limited.

PATER MINE

The company's main property consists of 22 claims and 10 lots known as the McFadden Option, in Spragge township, District of Algoma. The mine address is Algoma Mills. 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 continued throughout 1961. The shaft was deepened 1,203 feet to a total depth of 2,329 feet below surface, in 1961. The 8th, 9th, 10th, 11th, and 12th levels were established at vertical depths of 1,308, 1,508, 1,708, 1,908, and 2,108 feet, respectively, below the collar.

Development work in 1961 consisted of 6,083 feet of drifting, 283 feet of crosscutting, and 6,304 feet of raising. Total development footage to 31 December 1961 was as follows: 11,117 feet of drifts; 2,103 feet of crosscuts; 13,167 feet of raises. Diamond-drilling in 1961 consisted of 51 holes, totalling 4,571 feet, from underground.

New construction included a garage (22 x 20 ft.) and an addition to the mine office for stores and washroom (6 x 16 ft.), both wood-frame construction. The conveyor building was insulated on the outside; 250 feet of 10-inch-diameter woodstave pipe was added to the tailings line; and a fence was constructed around the sewage drain bed at the Pronto East subdivision.

Equipment added included the following:

- 1 hoist (60- x 48-in., double-drum, P.E.I., with 300-hp. motor, Canadian Ingersoll-Rand).
- 1 waste bin (100-ton capacity).
- 8 flotation cells (Fagergren).
- 1 flotation cell (Denver Equipment).
- 1 tractor (Caterpillar D4).

A total of 198,034 tons of ore was hoisted, 238,600 tons were milled; the mill treated an average of 654 tons daily.

The following, pertaining to the Pater operation, is taken from the general manager's report for the year ending 31 December 1961:

With the cessation of uranium production in mid-1960, the Pater shaft was reopened on the property to mine the copper deposit located some 2 miles from the uranium plant. Initial diamond-drilling had indicated a deposit containing 1,032,503 tons of 1.8 percent copper, allowing for 10-percent dilution, but without allowance for pillars.

Following development work and modification to the uranium mill, copper production commenced 2 January 1961. Low-grade development ore from the mine and the surface stockpile contributed to mill-feed until mid-year; and in the start-up period, mill performance, in respect to recovery and concentrate grade, was below expectation. Grade has since improved, and mill recovery is 96 percent as compared to a projected 90 percent. The concentrate grade is also better than forecast.

Production and Marketing

During the year, 238,600 tons of ore were processed, and the concentrate produced contained 7,072,952 pounds of copper.

Four cargoes of concentrate were exported to Europe via Sault Ste. Marie, during the 1961 shipping season.

The project achieved an operating profit position after the second month of production.

Mining and Development

The shrinkage-stoping method employed has resulted as foreseen in considerable hanging-wall dilution in sections of the orebody. This is at present being controlled by improved bolting patterns and pillar layout.

For the deeper levels, an evaluation is being made of partial conversion to horizontal cut-and-fill mining, using hydraulic fill, should this method prove necessary.

Partly and fully developed ore reserves at the year's end stood at about 222,000 tons compared to 105,000 tons when production started. Milling rate is determined by the rate at which the orebody can be developed downwards.

Development of the orebody so far has confirmed the ore indicated by diamond-drilling.

New ore has somewhat more than replaced the tonnage milled during the year. The most recent diamond-drilling indicates that downward continuity of the orebody may be expected.

Under consideration is an underground exploration program, to be carried out from the 12th level (or the 2,100-foot horizon), to determine whether other parallel shoots exist in the vicinity.

The average number of employees was 147: 92 underground, and 55 on surface. R. D. Lord was general manager; P. E. Young was mine manager.

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Shield Development Company Limited

Shield Development Company Limited was incorporated in March 1926, with an authorized capitalization of 5,000,000 shares of no par value, of which 3,296,081 shares have been issued. The directors and officers were: W. S. Row, president and director; K. C. Gray, R. V. Porritt, N. C. Urquhart, and Hon. Alistair Fraser, directors; C. H. Windeler, secretary; R. G. Rudolf, treasurer. The head office is at Suite 1600, 44 King Street West, Toronto 1. The mine address is Burchell Lake.

The property consists of a 310-acre copper prospect in the Kashabowie area, completely surrounded by the North Coldstream property.

An exploration program was in progress in 1961 from the North Coldstream mine, carried out by employees of that company. The 1,100- and 1,400-foot levels were established at 1,075- and 1,375-foot depths on Shield property; some 847 feet of drifting and 265 feet of crosscutting was completed. Previous to 1961, the development work done had been 347 feet of drifting and 170 feet of crosscutting on the 800-foot level. Some 46 diamond-drillholes, totalling 15,906 feet, were completed in 1961 from underground.

G. H. Montgomery was manager.

Sherbrooke Metallurgical Company Limited

Sherbrooke Metallurgical Company Limited was incorporated in May 1959, with an authorized capitalization of 200,000 shares of no par value, all of which have been issued. The directors and officers were: H. D. Carus, president and director; C. R. MacBrayne, vice-president and director; R. J. Bennett, secretary-treasurer and managing director; J. A. Battle, A. C. Carus, E. H. Carus, T.H. McCormack, L. C. Pejeau, A. E. Wigeland, 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.

The pelletized fluid-hearth process using zinc sulphides, instituted by the company at the end of 1960, was continued through 1961. Essentially, the zinc sulphide ore roasting plant converts the sulphur into sulphuric acid, while the roasted product is processed elsewhere in a smelter. A great deal of operating experience on the new type of fluid-bed roaster was acquired during the first year. Additions to the ore storage and handling equipment have been made. A pellet dryer has been installed, and the plant is scheduled to be operating at capacity in February 1962.

A total of 33,864 tons of zinc sulphide ore was processed in 1961.

The plant employs about 60 men. R. J. Bennett is 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 Limited. The authorized capitalization is 5,000,000 shares of \$1 par value, of which 2,992,267 shares have been issued. The directors and officers were: N. B. Keevil, president and director; C. G. MacIntosh, vice-president and director; J. L. C. Jenner, secretary and director; D. S. Brown, treasurer and director; J. C. Perry, director; R. A. Cranston, assistant-secretary. The head office is 11 Adelaide Street West, Toronto 1. The mine address is Timagami.

The company's holdings consist of a mineral lease on part of Timagami Island, in Lake Timagami, leases on 11 other islands, and 185 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 and milling operations continued throughout 1961.

Development footage in 1961 consisted of 1,256 feet of drifting, 523 feet of crosscutting, and 866 feet of raising. Total corrected development footage to 31 December 1961 was as follows: 14,815 feet of drifts; 2,426 feet of crosscuts; 3,527 feet of raises. Diamond-drilling in 1961 consisted of 400 holes, totalling 59,916 feet, from underground and 69 holes, totalling 14,359 feet, from surface.

New construction consisted of a dust-collector building, an addition to the crusher house (16 x 35 x 16 ft., frame construction). New equipment added included a dust collector and a dump truck (15-ton, International).

A total of 54,642 tons was hoisted, from which 7,062 tons was discarded. The mill treated 54,039 tons of ore.

The following is taken from the mine manager's report for the year ending 30 June 1961:

Mining

The following orebodies were mined during the year: No. 2 open pit and Nos. 3, 4, 5, 6, 7, 9, and 11 orebodies. Mining was completed in No. 5 orebody and the broken ore drawn from No. 7. No. 3 orebody was prepared for mining, and 3,000 tons of ore were removed by the year's end. Mining started in No. 9 orebody. Stopping continued in Nos. 2, 4, and 6 orebodies.

Total tonnage of ore broken during the year was 53,534.

Milling

During the year, the mill treated 50,078 tons of ore grading 6.11 percent copper. Recovery was 98.56 percent. Contained metals in the 11,053.13 tons of concentrates shipped were:

| | | |
|--------|--------------|-----------|
| Copper | pounds | 6,031,301 |
| Gold | oz. | 994,149 |
| Silver | oz. | 16,736.46 |

The crushing-plant building was enlarged to make room for a cone-crusher and an improved conveyor layout.

The concentrator flow-sheet was modified to improve recovery and grade of concentrates.

Ore Reserves

| Orebody | Ore In Place | Grade Copper | Ore Broken | Grade Copper |
|-------------------|--------------|--------------|------------|--------------|
| | tons | percent | tons | percent |
| No. 2 | 2,400 | 6.0 | 934 | 6.0 |
| No. 3 | 15,000 | 12.0 | 1,240 | 11.0 |
| No. 4 | 5,000 | 9.0 | 5,644 | 8.0 |
| No. 6 | 26,000 | 8.0 | 10,238 | 7.5 |
| No. 6A | 10,000 | 7.0 | | |
| No. 9 | 3,000 | 7.0 | 582 | 7.5 |
| No. 10 | 5,000 | 7.5 | | |
| No. 11 | 3,000 | 7.0 | 53 | 7.0 |
| No. 12 | 5,000 | 7.0 | | |
| Total and Average | 74,400 | 8.5 | 18,691 | 7.8 |

Total ore reserves were 93,091 tons of 8.36 percent copper.

An additional 15,000 tons of 5-percent copper ore is inferred above the 825-foot level but is not sufficiently developed or explored to be included in the reserves.

The average number of employees was 129: 79 underground, and 50 on surface. W. P. Houston was mine manager.

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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, Sr., president and director; R. T. Birks, vice-president and director; R. M. P. Hamilton, P. D. P. Hamilton, G. W. Gooderham, J. C. Perry, and H. D. Carus, directors; B. E. Martin, secretary-treasurer. The head office is at 25 Adelaide Street West, Toronto 1. The mine address is Manitouwadge.

The company holds thirty claims in Gemmell and Mapledoran townships, Manitouwadge Lake area, District of Thunder Bay, adjoining the west boundary of the Geco property.

Operations continued throughout 1961.

SHAFTS, WILLROY MINE

| | Claim No. | Inclination | Number of Compartments | Total Depth from Surface |
|-------------|-----------|-------------|------------------------|--------------------------|
| No. 1. | T.B.46933 | Vertical | 4 | feet 2,243 |
| No. 2. | T.B.46938 | Vertical | 2 | 530 |

No. 1 shaft was sunk 413 feet to a total depth of 2,243 feet below surface. New levels established were the 12th, No. 1 crusher, No. 3 loading-pocket, and the 14th level, at depths of 1,897, 2,002, 2,114, and 2,205 feet below the shaft collar.

The following development work was done during the year: drifting, 3,560 feet; crosscutting, 976 feet; and raising, 1,606 feet. The total development footage to 31 December 1961 was as follows: drifts, 23,280 feet; crosscuts, 10,726 feet; raises, 16,225 feet. Diamond-drilling consisted of 530 holes, totalling 46,336 feet, from underground and 11 holes, totalling 5,218 feet, from surface.

New construction included a wood-frame bunkhouse (92- x 20-ft., asbestos shingle siding, asphalt roofing paper).

The following new plant equipment was added:

- 1 compressor (ES-1, 12- x 9-in., serial 14177, Canadian Ingersoll-Rand).
- 1 mucking machine (model LM-250, serial 653062, Atlas Copco).
- 1 jaw-crusher for underground (30- x 42-in., Traylor, type H).
- 1 raise machine (serial 224, Alimak, model STH-3K).

A total of 420,146 tons of ore was hoisted, 421,772 tons was milled; the mill treated an average of 1,156 tons daily.

The following is taken from the manager's report for the year ending 31 December 1961:

Mining

All stoping was carried on during the year with the long-hole benching method. Little trouble was experienced with this method on the upper levels, but as stoping operations progress to deeper horizons some wall pressure and associated failure is becoming evident.

In order to cope with this condition and avoid expensive changes in mining method, heavier equipment and faster mucking cycles were introduced to pull the stopes empty before wall failure became serious. Stope preparation was accelerated in the involved areas. A program to reclaim tailings for hydraulic backfill was initiated and brought to the stage where fill could be introduced into the mine at short notice.

Costs

Despite a lower divisor, total unit costs remained approximately the same, with mining and development costs slightly down and both milling and general expense slightly up. A comparison of operating costs during the years 1960 and 1961 follows:

| | Cost Per Ton Milled | |
|-----------------------------------|---------------------|---------------|
| | 1961 | 1960 |
| Exploration and development | \$0.26 | \$0.31 |
| Mining | 2.41 | 2.44 |
| Milling | 1.59 | 1.54 |
| Administrative and general | 0.92 | 0.86 |
| Total | \$5.18 | \$5.15 |

Milling

There was an appreciable improvement in copper metallurgy during 1961. This was accompanied by a decline in zinc recovery but, owing to the higher value of copper, a net gain economically was realized.

An effort was made to reduce reagent costs by replacing soda-ash with lime or ammonia as a Ph regulator in copper flotation, and sustained experiments toward this end were carried on in the plant. At the end of the year, lime was being used on a steady basis at a saving over soda-ash of 10 cents per ton. Experimentation continues.

Magnetic testing was carried out on zinc concentrates with a view to up-grading by the elimination of pyrrhotite iron. A number of tests run on a pilot scale were unsuccessful in separating sufficient pyrrhotite from the sphalerite to warrant capital expenditures.

The average milling results, as compared with 1960, follow:

AVERAGE MILLING RESULTS, 1961

| | | |
|-----------------------------|------------------|-------|
| Average daily tonnage | tons | 1,156 |
| Mill running time | percent of total | 95.86 |

| | Assays | | | | Recoveries | | | |
|---------------------------------|---------|---------|---------|---------|-------------|-------------|-------------|-------------|
| | Ag | Cu | Pb | Zn | Ag | Cu | Pb | Zn |
| | percent | percent | percent | percent | percent | percent | percent | percent |
| Heads | 1.74 | 1.34 | 0.21 | 6.68 | 100.0 | 100.0 | 100.0 | 100.0 |
| Cu concentrate | 20.57 | 24.03 | 0.92 | 7.24 | 57.1 | 87.1 | 21.7 | 5.2 |
| Pb concentrate | 60.80 | 7.09 | 48.28 | 5.03 | 10.8 | 1.6 | 72.3 | 0.2 |
| Zn concentrate | 1.23 | 0.56 | 0.02 | 54.82 | 7.4 | 4.4 | 1.2 | 86.3 |
| Tails | 0.51 | 0.11 | 0.01 | 0.65 | 24.7 | 6.9 | 4.8 | 8.3 |
| Payable Recoveries | | | | | 67.9 | 88.7 | 72.3 | 86.3 |

AVERAGE MILLING RESULTS, 1960

| | | |
|-----------------------------|------------------|-------|
| Average daily tonnage | tons | 1,173 |
| Mill running time | percent of total | 94.20 |

| | Assays | | | | Recoveries | | | |
|---------------------------------|---------|---------|---------|---------|-------------|-------------|-------------|-------------|
| | Ag | Cu | Pb | Zn | Ag | Cu | Pb | Zn |
| | percent | percent | percent | percent | percent | percent | percent | percent |
| 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 |

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Ore Reserves

As of 1 January 1962, the total of broken, proved, and indicated reserves stood at 2,360,000 tons, divided as follows:

| Zone No. | Ore | Copper | Zinc | Lead | Silver |
|------------------------|-----------|---------|---------|---------|--------|
| | tons | percent | percent | percent | ounces |
| 1..... | 574,015 | 1.39 | 0.45 | — | 0.42 |
| 2..... | 79,148 | 0.02 | 5.33 | — | 0.34 |
| 3..... | 1,279,019 | 1.77 | 5.58 | 0.09 | 1.43 |
| 4..... | 47,884 | 0.05 | 7.60 | 1.28 | 4.72 |
| 5..... | 66,071 | 0.03 | 7.04 | 0.13 | 2.07 |
| 6..... | 313,863 | 2.32 | 1.15 | — | 0.92 |
| Total and Average..... | 2,360,000 | 1.57 | 3.82 | 0.08 | 1.16 |

The average number of employees was 234: 115 underground, and 119 on surface. R. S. Hafidson was manager.

PLATINUM METALS—*see* NICKEL AND COPPER

SELENIUM—*see* NICKEL AND COPPER

SILVER AND COBALT

The mines of the Cobalt and Gowganda areas shipped 5,070 tons of concentrates to Noranda Mines Limited and 87 tons of concentrates to Cobalt Refinery. In addition, 1,181 tons of concentrates were shipped to refineries in the United States. From this total quantity of 6,338 tons, 4,680,763 ounces of silver were recovered. In the refining processes of the base metals mines, 1,999,303 ounces were recovered; 1,785,643 ounces were recovered in the processing of the ores of the nickel-copper mines, and 404,693 ounces were recovered in the refining of the ores of the gold mines. The quantity of silver produced in Ontario decreased 20.95 percent, from the production of 1960, and the value of the product decreased 16.19 percent.

There was reported recovery of 99,995 pounds of cobalt in the form of metal and salts from the concentrates shipped from the Cobalt-Gowganda area. In the refining of ores from the nickel-copper mines 2,784,425 pounds were recovered, making a total for the province of 2,884,420 pounds. This was a decrease of 11.48 percent from the quantity shipped in 1960. The value of the product was \$4,309,912, which was a decrease of 31.73 percent.

The mines of the Cobalt-Gowganda area paid \$451,714 to 91 salaried personnel, and \$1,944,456 to 496 wage-earners. Fuel and electricity used cost \$351,016, and process supplies cost \$378,435.

SILVER PRODUCTION

| Source | 1957 | 1958 | 1959 | 1960 | 1961 |
|--|----------------------------------|------------------------|------------------------|------------------------|------------------------|
| 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. \$ 4,316,480 3,771,309 | 6,043,502 5,257,847 | 6,657,162 5,843,657 | 7,155,909 6,362,319 | 4,680,763 4,412,087 |
| In crude gold bullion. | oz. \$ 425,875 368,451 | 442,249 380,951 | 408,114 358,242 | 442,629 393,541 | 404,693 381,463 |
| Recovery for nickel-copper refineries. | oz. \$ 1,575,138 1,376,188 | 1,217,510 1,056,920 | 1,384,223 1,215,071 | 1,665,314 1,480,631 | 1,785,643 1,683,147 |
| In copper-gold-silver ores. | oz. \$ 17,056 14,968 | — — | — — | — — | — — |
| In silver-lead-zinc-copper ores. | oz. \$ 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 | 1,999,303 1,884,543 |
| Total production | oz. 6,910,130 | 9,815,257 | 10,540,856 | 11,220,823 | 8,870,402 |
| Total value | \$ 6,034,598 | 8,529,142 | 9,252,763 | 9,976,434 | 8,361,240 |

SHIPMENTS FROM SILVER MINES, SMELTERS, AND REFINERIES

| Year | Bismuth | Copper | Lead | Nickel | Cobalt | Arsenic | Silver | Total |
|-----------|----------------|------------------|---------------|--------------------|----------------------|---------------------|----------------------------|-------------|
| 1904-1956 | 116 262,377 | 1,414 599,597 | 385 36,709 | 7,740 3,098,076 | 20,640 46,273,874 | 83,220 6,868,271 | 470,215,000 287,915,599 | 345,054,503 |
| 1957 | 7 21,372 | 228 131,927 | 27 5,589 | 218 531,077 | 669 2,647,917 | 1,848 137,112 | 4,316,000 3,771,309 | 7,246,303 |
| 1958 | 9 26,779 | 113 57,340 | 34 4,661 | 79 119,896 | 379 1,506,783 | 1,162 94,542 | 6,043,000 5,257,847 | 7,067,848 |
| 1959 | 16 37,748 | 92 54,645 | 63 8,559 | 89 133,562 | 277 962,653 | 789 63,786 | 6,657,000 5,843,657 | 7,104,610 |
| 1960 | 19 45,402 | 136 82,304 | 74 12,297 | 64 130,467 | 170 616,713 | 862 70,400 | 7,155,909 6,362,319 | 7,319,902 |
| 1961 | 10 22,388 | 92 53,643 | 27 5,445 | 44 63,107 | 48 162,572 | 210 16,772 | 4,680,536 4,411,873 | 4,735,800 |
| Totals | 177 416,066 | 2,075 979,456 | 610 73,260 | 8,234 4,076,185 | 22,183 52,170,512 | 88,091 7,250,883 | 499,067,445 313,562,604 | 378,528,966 |

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 2,257,327 shares have been issued. The directors and officers were: J. F. Paxton, president and director; George Scott, secretary-treasurer and director; R. D. Bell, assistant secretary-treasurer and director; H. E. Cawley, L. G. Smith, L. G. Phelan, and W. E. McLean, directors. The head office is at Suite 405, 25 Adelaide Street West, Toronto 1. The mine address is Box 140, Cobalt.

The company has acquired properties formerly held by Silanco Mining and Refining Company Limited; Cobalt Lode Silver Mines Limited; Penn-Cobalt Silver Mines Limited; Gilgreer Mines Limited; Keylode Cobalt Silver Mines Limited; Hellens Mining and Reduction Company Limited; and others in the Cobalt, South Lorrain, and Gowganda areas, District of Timiskaming. A group of mines in Coleman township including the Beaver and Temiskaming mines was acquired in 1955, and the O'Brien mine in 1958. The company also owns, or has an interest in, a number of claims in the Blind River area, District of Algoma, and in Strathcona township, Timagami area, District of Nipissing.

All mining operations in 1961 were confined to the company's properties in the Cobalt area.

AGAUNICO PROPERTY

This mine, located in Bucke township, was permitted to fill with water. A watchman was being kept on the property.

BRADY LAKE PROPERTY

The Brady Lake property, which has also been called the Silver-Miller mine, is in lots 2 and 3, concession III, Coleman township. It includes six claims comprising the old Lumsden, Rochester, Gillies, Cobalt Central, and Coleman Development (Pan Silver) mines.

The property, which adjoins the south boundary of the Christopher property was leased from Silver-Miller, and a development program was commenced.

SHAFTS, BRADY LAKE PROPERTY

| | Location | Inclination | Number of Compartments | Total Depth from Surface |
|---|---|-------------|------------------------|--------------------------|
| No. 1 shaft (Lumsden)..... | Claim No.367 | Vertical | 2 | feet 400 |
| No. 4 winze (below 200-foot 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 $\frac{1}{4}$, N. $\frac{1}{2}$, lot 2, con. III, Coleman twp. | Vertical | 2 | 632 |
| No. 1 winze (below 285-foot level) (Pan Silver)..... | ————— | Vertical | 2 | 447 |
| No. 3 winze (below 610-foot level) (Pan Silver)..... | ————— | Vertical | 2 | 746 |

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The property was operated from 5 September to 31 December, 1961.

Operations were conducted through No. 4 shaft from surface to the 610-foot level, and No. 3 winze from the 610-foot to the 725-foot level.

A total of 71 feet of drifting and 208 feet of raising was completed. Total development footage to 31 December 1961 was as follows: 32,014 feet of drifts and sub-drifts; 7,505 feet of crosscuts; 9,775 feet of raises.

Some 12 diamond-drillholes, totalling 1,055 feet, were drilled from underground.

A total of 541 tons of ore was hoisted and milled.

CHRISTOPHER PROPERTY

The Christopher mine adjoins the south boundary of the Cobalt Lode mine, in lot 2, concession III, Coleman township.

SHAFTS, CHRISTOPHER MINE

| | Claim No. | Inclination | Number of Compartments | Depth from Surface |
|---------------------------------------|-----------|-------------|------------------------|--------------------|
| No. 1 shaft..... | 1970 | Vertical | 2 | feet 295 |
| No. 2 shaft..... | 106 | Vertical | 2 | 415 |
| 650 winze (collared at 556 feet)..... | — | Vertical | 2 | 622 |

The Cobalt Lode and Christopher shafts are connected on the 400-foot level, and the nearby Brady Lake No. 4 shaft, leased from Silver-Miller, connects with the Cobalt Lode shaft on the 600-foot level. Mining operations throughout 1961 were on the Christopher property, with ore hoisted in all three shafts.

Development work during the year consisted of 3,436 feet of drifting, 1,451 feet of crosscutting, and 1,714 feet of raising. Total development footage to 31 December 1961 was as follows: 12,316 feet of drifts; 4,279 feet of crosscuts; 9,643 feet of raises. Diamond-drilling in 1961 consisted of 31 holes, totalling 9,550 feet, from underground.

New construction in 1961 included a combination office and dry-house (48.6 x 15.6 ft.) and a fuse-house (10.6 x 8.6 ft.); both wooden construction, mine-siding insulated.

NIPISSING PROPERTY

The Nipissing property consists of about 1,253 acres in Coleman township, District of Timiskaming.

A program of diamond-drilling was carried out from 2 January to 31 May, 1961. Some 22 diamond-drillholes, totalling 5,652 feet, were completed from underground.

VIOLET PROPERTY

The Violet property, consisting of about 40 acres, is located to the south of the O'Brien property.

Operations to rehabilitate the property, including the hoist-room, dry, and headframe, were continued from 1 June to 31 December, 1961. The shaft was pumped to the bottom level at 685 feet. Some 30 feet of crosscutting was completed on the 350-foot level to establish a pumping station. At the year's end the underground workings were being cleaned up preparatory to starting lateral

development. The feasibility of connecting through to the lower O'Brien workings for production purposes was also being investigated. A 42-inch, double-drum, electric hoist, two electric pumps (40 hp., 200 gpm. at 400-ft. head), and a cage in the shaft, had been installed.

O'BRIEN PROPERTY

Nipissing-O'Brien Mines Limited was incorporated in January 1952. The company acquired the properties of M. J. O'Brien Limited and Nipissing Mines Company Limited, in concessions V and VI, Coleman township, District of Timiskaming.

Nipissing-O'Brien Mines Limited operated the property until June 1958, when it was purchased by Agnico Mines Limited. Mining operations continued at the O'Brien mine throughout 1961.

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 1961 consisted of 443 feet of drifting, 954 feet of sub-drifting, 154 feet of crosscutting, and 1,458 feet of raising. Total development footage to 31 December 1961 was as follows: 6,815 feet of drifts; 2,837 feet of subdrifts; 2,109 feet of crosscuts; 7,744 feet of raises. Some 182 diamond-drill-holes, totalling 22,163 feet, were completed in 1961 from underground.

A total of 30,450 tons of ore was hoisted; 33,460 tons was milled.

PENN MILL (FOSTER PROPERTY)

The Penn mill operated throughout the year, treating ore from the producing mines. The mill treated a total of 97,125 tons, averaging 304 tons daily.

The average number of employees at all operations was 168: 97 underground, and 71 on surface. H. E. Cawley was manager.

Big Jackpot Mines Limited

Big Jackpot Mines Limited was incorporated in May 1952, with an authorized capitalization of 4,000,000 shares of \$1 par value, of which 3,062,957 shares have been issued. The directors and officers were: D. F. Hurd, president and managing director; T. R. Rowe, vice-president and director; T. J. Day, and C. R. Archibald, directors; J. R. McDougall, secretary-treasurer. The head office address is 82 Government Road West, Kirkland Lake.

The property consists of six claims in Tudhope township, District of Timiskaming, about 5 miles northeast of Elk Lake. Operations proceeded from 11 June to 2 December, 1961, on the silver-copper prospect.

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Some 900 feet of surface trenching averaging 4 feet in depth was completed. Eight diamond-drillholes, totalling 1,249 feet, were completed from surface in 1961. Two shafts, located in claim M.R.17738, one having two compartments 105 feet deep, were reported but were not used in 1961 operations.

D. F. Hurd, president, was in charge at the property; five men were employed during the period of operation.

Cobalt Refinery

The treatment plant formerly owned by Coballoy Mines and Refiners Limited, after being idle for several years was taken over and rehabilitated on 1 May 1961 by J. J. Gray, 80 Richmond Street West, Toronto. It is located 6 miles south of Cobalt and $\frac{1}{2}$ mile east of highway No. 11. The plant address is R.R. No. 1, Cobalt.

In the silver-refining end of the plant, all modifications were completed, and it is operating on limited feed. These include the smelting furnace (300 kva.), the ten-hearth Edwards roaster, the arsenic bag house, and the silver refinery. Late in the year, shipments from a local silver producer were treated.

A large quantity of impure arsenic oxide, which had been stored on the property for a number of years, was roasted and then upgraded in the arsenic bag house. The resulting product was used to make sodium arsenite, for which a market is being established. The residue was shipped to an area smelter for treatment.

A new coke-fired refinery was constructed to produce 99-percent plus white arsenic. The cobalt plant is being renovated and equipment added for the treatment of the speiss product received from the smelter. Early in the new year this plant will be ready to recover the contained metals and silver in the speiss.

The reported production during the period of operation was as follows: silver, 64,263.6 ounces; gold, 2.0 ounces; bismuth, 200.6 pounds; lead, 2,891 pounds; refined arsenic, 74,106 pounds; and sodium arsenite, 7,101 gallons.

J. N. Cram was manager of the plant; there were 36 employees.

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 3,835,005 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 fourteen claims in Coleman township, District of Timiskaming, about $1\frac{1}{2}$ miles east of Cobalt.

The mine operated from 2 January to 31 December, 1961; the mill operated from 5 January to 21 December, 1961.

The main shaft was sunk 39 feet in 1961 to a total depth of 645 feet below surface. There are two winzes, one of which extends to a depth of 800 feet below surface. A total of 917 feet of drifting, 491 feet of crosscutting, and 1,662 feet of

raising was completed in 1961. Total development footage by Deer Horn Mines, to 31 December 1961, was as follows: 1,961 feet of drifts; 1,069 feet of crosscuts; 2,541 feet of raises. Some 178 diamond-drillholes, totalling 18,196 feet, were drilled from underground.

New equipment installed included a single-drum hoist (Canadian Ingersoll-Rand, No. H-173) and a mine cage in No. 2 winze; a stoper (Atlas Copco); and an air trammer (Eaton Model 69).

The former Nipissing O'Brien mill, a concentrator (100-ton per day), comprising crushing, grinding, gravity, and flotation concentration, was used.

A total of 10,005 tons of ore was hoisted; 3,902 tons was discarded; 8,725 tons was milled; the mill averaged 85 tons daily.

The average number of employees was 35: 23 underground, and 12 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, managing director; P. E. Fleming, secretary-treasurer; R. F. Burns, assistant secretary-treasurer. The head office address is 140 Wellington Street, Ottawa. The plant is at Deloro.

Operations continued from 1 January to 30 April, 1961, at which time the plant closed down, except for clean-up and salvage operations. There was an undetermined production of silver, cobalt, nickel, and arsenic during the period of operation.

The average number of employees was 69. J. N. Cram, resident manager, was replaced by W. M. Regan.

Glen Lake Silver Mines Limited

Glen Lake Silver Mines Limited was incorporated in June 1961, with an authorized capitalization of 5,000,000 shares of \$1 par value, of which 1,900,005 shares have been issued. The directors and officers were: G. E. Buchanan, president and director; R. J. Murphy, vice-president and director; R. J. Juby and A. J. Fortens, directors; Frank Cadesky, secretary-treasurer. The head office is at 100 Adelaide Street West, Toronto 1. The mine address is Box 590, Cobalt.

The property, formerly known as the Bailey mine, consists of about 58 acres in Coleman township, District of Timiskaming. It is located on the north side of Glen Lake across from the Foster mill. The vertical, two-compartment No. 1 shaft, located on the southwest quarter of the north half of lot 4, concession IV, Coleman township, had been sunk to a depth of 283 feet by former operators. There are five levels, including the adit level off the shaft.

Operations progressed from 6 June to 31 December, 1961. The mine was dewatered, and the headframe, shaft collar, and adit retimbered. Development work consisted of 100 feet of drifting, 72 feet of crosscutting, and 147 feet of raising on the 5th or lower level. Some eight diamond-drillholes, totalling 1,343

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feet, were completed from underground. A frame office building (32 x 16 ft.) was constructed, and an air hoist (Jenckes, serial No. 1013 ARF, 9 x 12 in., 5,500 lb.) was installed.

The average number of employees was 5: 3 underground, and 2 on surface; M. C. Halstead was mine manager.

Keeley-Frontier Mines Limited

Keeley-Frontier Mines Limited was incorporated in September 1959, with an authorized capitalization of 5,000,000 shares of \$1 par value, of which 2,972,535 shares have been issued. The directors and officers were: M. C. Mosher, president and director; F. H. Todd, vice-president and director; C. R. Archibald, secretary-treasurer and director; R. J. Ash and H. Van Smith, directors; T. F. C. Cole, assistant secretary. The head office is at 67 Yonge Street, Toronto 1. The mine address is Cobalt, Box 339.

The company acquired the old Keeley and Frontier properties, consisting of about 380 acres at Silver Centre in South Lorrain township, District of Timiskaming, about 20 miles south of Cobalt. The two properties, which adjoin, had a very successful early production history. Current efforts by the company are concentrated on the Frontier property, although the Keeley workings are being dewatered through drillholes underground from the Frontier.

Operations progressed from 5 July to 31 December, 1961.

The three shafts on the Frontier property were rehabilitated, and pumping was being carried out in No. 3 shaft, which is 630 feet deep. The water was pumped to the 3rd level, 241 feet below surface, by the year's end. Some 33 feet of drifting and 265 feet of raising was completed on the first level in 1961. One diamond-drillhole, 51 feet in length, was completed from surface.

New construction in 1961 included: a wooden headframe, 80 feet high, over No. 3 shaft; a combined hoist-powerhouse building; a combined dry-office building; a temporary office building; a temporary hoisthouse; explosive and detonator storage magazines.

New equipment installed was as follows:

- 1 compressor, electric-driven (Holman, 500-cfm.).
- 1 generator, diesel-electric (General Motors, 260 kva.).
- 1 hoist (Canadian Ingersoll-Rand, P.E-1, 42- x 30-in., with 75-hp. motor).
- 1 pump (Pumona, with 75-hp. motor).

The average number of employees was 11: 4 underground, and 7 on surface. Roger Gareau was manager.

Langis Silver and Cobalt Mining Company Limited

Langis Silver and Cobalt Mining Company Limited was incorporated in February 1953, with an authorized capitalization of 300,000 shares of \$1 par value. In May 1957, the capitalization was increased to 5,000,000 shares of \$1 par value; 3,800,015 shares have been issued. The directors and officers were: A. W. White, president and director; R. A. Halet, vice-president and director; K. J. Benner, David Burt, and J. E. Armstrong, directors; H. R. Heard, secretary-treasurer. The head office is at 25 Adelaide Street West, 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 1961.

SHAFTS, LANGIS SILVER PROPERTY

| | Claim No. | Inclination | Number of Compartments | Total Depth from Surface |
|---|-----------|-------------|------------------------|--------------------------|
| No. 1 shaft (inactive)..... | T.354 | 75° | 2 | feet 270 |
| No. 3 shaft..... | T.354 | Vertical | 2 | 372 |
| No. 4 shaft (inactive)..... | T.1474 | Vertical | 2 | 150 |
| No. 6 shaft..... | T.1110 | Vertical | 2 | 411 |
| No. 4 winze (below 260-foot level)..... | — | Vertical | 2 | 310 |

No. 3 shaft was sunk 72 feet, and No. 6 shaft was sunk 30 feet to total depths of 372 feet and 411 feet, respectively, below the collar during 1961. The 320-foot and 355-foot levels were established in No. 3 shaft, and the 400-foot level in No. 6 shaft. Development work consisted of 2,573 feet of drifting, 742 feet of cross-cutting, and 427 feet of raising. Total development footage to 31 December 1961 was as follows: drifts, 16,287 feet; crosscuts, 15,252 feet; raises, 3,574 feet. Diamond-drilling in 1961 consisted of 223 holes, totalling 22,642 feet, from underground.

The following is taken from the mine manager's report for the year ending 31 December 1961:

Operating Costs

| | Per Ton Ore Treated | |
|---------------------------------|---------------------|---------|
| | 1961 | 1960 |
| Development..... | \$ 7.69 | \$ 8.26 |
| Mining..... | 6.10 | 6.77 |
| Ore treatment..... | 4.29 | 4.37 |
| Mine office and management..... | 0.93 | 1.11 |
| General account..... | 0.34 | 0.76 |
| Total..... | \$19.35 | \$21.27 |

Milling

Toward the end of the year, the milling rate of the new circuit had been increased to average 100 tons daily or better.

Several changes have been made to improve the crushing circuit to include a new Nordberg rod-deck screen.

The original 5-foot ball mill has been made ready for operation, so that the total grinding capacity of the two units approximates 175 tons per day.

Mill heads were lower at 25.37 ounces per ton. However, the loss of production was partly compensated by increasing the tons milled from 23,383 to 29,434. With a lower head, recovery decreased to 93.96 percent.

Increased tonnage milled accounted for lower cost per ton milled.

| | 1961 | 1960 |
|------------------------------------|---------|---------|
| Milled..... tons | 29,434 | 23,383 |
| Average per day..... tons | 81.35 | 67.3 |
| Mill heads per ton silver..... oz. | 25.32 | 40.17 |
| Silver produced..... oz. | 687,828 | 895,690 |
| Calculated recovery..... percent | 93.96 | 95.36 |

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Development

After good results in drilling below present levels, it was decided to deepen both No. 3 and No. 6 shafts. Lateral development confirmed these results with 340 linear feet of new ore opened up on the 355-foot level, No. 3 shaft, and 191 feet on the 400-foot level, No. 6 shaft, at the year's end, with several veins yet to be developed.

The most significant development during the year was the discovery of an ore shoot in the underlying Keewatin rocks. On the 355-foot level, No. 6 vein was developed to indicate an ore length of 261.5 feet, of which 25 percent was in Keewatin rocks. No effort has yet been made to test this vein below the 355-foot horizon and in the Keewatin.

Ore Reserves

At the year's end, there were nine working stopes, with three development headings in ore and three headings in waste. At that time, development of the new levels had not reached all of the objectives. It is hoped that, in spite of increased milling rate, broken-ore reserves will be materially increased.

The average number of employees was 76: 56 underground, and 20 on surface. J. E. Jerome was mine manager.

Le Mans Explorations Limited

Le Mans Explorations Limited was incorporated in April 1955, with an authorized capitalization of 5,000,000 shares of \$1 par value, of which 1,694,705 shares have been issued. The directors and officers were: Al. Goldman, president and director; Nathan Gotfrid, vice-president and director; W. V. MacInnes, treasurer and director; Samuel Lyons and Morris Wortzman, directors; T. F. C. Cole, secretary. The head office is at 4 King Street West, Toronto 1.

The company leased the Otisse Silver property, consisting of one claim, E.B.21, in Mickle township, District of Timiskaming, about 7 miles southwest of Elk Lake.

Operations proceeded from 2 October to 13 December, 1961. The vertical, two-compartment shaft, 150 feet deep, was rehabilitated and the workings dewatered. Channel and chip samples were taken on the 75- and 150-foot levels.

G. E. Moody, geological consultant, was in charge; four men were employed during the period of operation.

McAllister Lease

The Buffalo property, located in Coleman township on the south edge of the town of Cobalt, is owned by Agnico Mines Limited. For a number of years it has been leased by R. C. McAllister.

Two small shipments of ore from an old open cut on the property were treated at the Foster mill.

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 forty-two claims, is located in Haultain and Nicol townships, Gowganda area, District of Timiskaming. The property is in two sections, the Castle and the Capitol mines. In recent years all major operations have been in the Capitol mine.

The mine operated throughout the year; the mill from 1 May to 12 December, 1961.

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 1961 included 2,682 feet of drifting, 2,738 feet of crosscutting, and 658 feet of raising. Total development footage to 31 December 1961 was as follows: 31,772 feet of drifts; 15,782 feet of crosscuts; 7,785 feet of raises. Diamond-drilling in 1961 consisted of 139 holes, totalling 26,957 feet, from underground.

The following is taken from annual report for the year ending 31 December 1961:

At the Castle mine, silver production of 1,009,140 ounces from the treatment of 23,386 tons of ore was below the 1960 record of 1,252,222 ounces, but is nevertheless a creditable production for so small an operation. Silver commanded a better price in 1961 at \$1.00 per ounce, compared with 91 cents in 1960. Net operating profit amounted to \$298,909, compared with \$339,439 in the previous year, the decrease being due to lower production.

All ore was mined on claim L.M.111 and came from vein systems that have supplied production for the past three years. Reserves are depleted, but this has happened before at Castle and is usual in this type of operation. A number of potential ore areas, which justify exploration, particularly in view of the present favourable price for silver, are being investigated.

The average number of employees was 87: 55 underground, and 32 on surface. G. D. McLeod was manager.

Mensilvo Mine

Mensilvo Mines Limited owned a property consisting of 25 acres in lot 6, concession IV, Coleman township, District of Timiskaming, about 3 miles southeast of Cobalt. The property was reported on in an earlier Annual Report.¹ In 1961 the property was acquired by J. J. Gray, 80 Richmond Street West, Toronto, and operated privately as the Mensilvo mine. The mine address is Box 115, North Cobalt.

¹ *Mining Operations in 1954*, Ontario Dept. Mines, Vol. LXIV, 1955, pt. 2, p. 131.

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The mine operated from September to 15 December, the mill from September to 30 November, 1961.

The vertical, two-compartment No. 7 shaft, 214 feet deep, was pumped to the 140-foot level, and lateral development started in the easterly workings. Development footage consisted of 30 feet of drifting and 40 feet of raising, on the 140-foot level.

New construction in 1961 consisted of an addition to the mill building (7 x 32 ft.) and an addition to the boiler house (12 x 7 ft.). The 50-ton mill on the property was rehabilitated, and the following equipment added: a thickener (wood-stave, 10 x 5 ft.); a small-leaf filter press (Oliver United); a vacuum pump and motor; a sand pump (S.R.L. 2 x 2 in.).

A total of 460 tons of ore was hoisted; 400 tons was milled, at an average of 30 tons daily.

The average number of employees was 7: 4 underground, and 3 on surface. C. F. Morgan was general manager.

Mentor Exploration and Development Company Limited

Mentor Exploration and Development Company Limited was incorporated in March 1926, with an authorized capitalization of 5,000,000 shares of \$0.50 par value, of which 3,355,746 shares have been issued. The directors and officers were: Denison Denny, president and director; A. W. Johnston, J. D. Smith, and E. A. Stern, directors; Margaret B. Smith, secretary-treasurer. The head office is at 100 Adelaide Street West, Toronto 1. The mine address is Box 739, Cobalt.

The Cobalt property consists of eight claims in Coleman township, and four in Bucke township, District of Timiskaming. Operations were confined to the Coleman township property, formerly called the Sycee-Cobalt holdings, which is just north of Cross Lake and adjoins the O'Brien ground, which is on the east.

The vertical, three-compartment, main shaft, was collared and sunk 411 feet in 1961. Some four diamond-drillholes, totalling 981 feet, were completed from underground. New construction included the following:

Dry-house (48 x 20 x 12 ft., frame construction, asbestos mine siding).

Shaft-house (23.9 x 32 x 10 ft., with 65-foot headframe, frame-and-timber construction, shiplap covering).

Hoist-house (16 x 30 x 8 ft., frame construction, shiplap with asbestos mine siding).

New equipment installed consisted of the following: a hot-air, oil-fired suspended furnace (American Standard Products, Model S.O. 90); a dry transformer (English Electric, cap. 10 kva. 60-cycle, 110/230 v.); a transformer (cap. 1½-kva. 550/110 v.); a hoist (Canadian Ingersoll-Rand, 10 x 12 in., Model SSR, 42-in. diameter); a pump (Canadian Ingersoll-Rand Motorpump, type 2-MRV, cap. 280 gpm.); a duplex air pump (6 x 4½ x 3½ in.); a cage; and a bicycle sheave wheel (48-in. diameter).

The contractor, F. A. McIntyre, employed an average of 14 men: 12 underground, and 2 on surface. J. E. Armstrong was in charge of operations at the property for Mentor Explorations.

Professor Silver Mines Limited

Professor Silver Mines Limited was incorporated in August 1949, with an authorized capitalization of 2,000,000 shares of no par value, of which 1,227,838 shares have been issued. The directors and officers were: J. M. Cunningham-Dunlop, president and director; Douglas Henderson, vice-president and director;

H. E. Cawley, W. B. Maxwell, G. C. Russell, and D. A. Thomson, directors; C. C. D. Pringle, secretary-treasurer; Gwendolyn M. Mahon, assistant secretary; H. B. Briden, accountant. The head office is at 360 Bay Street, Toronto 1. The mine address is Box 39, Cobalt.

The property, consisting of seventeen claims in the Gillies Limit, District of Timiskaming, formerly known as the South Giroux mine, is about 3½ miles southeast of Cobalt.

Early in the year an adit 920 feet long was driven from the base of a sheer rock face, and lateral development followed on several silver veins intersected. The workings are about 200 feet below the highest point of ground, and some 1,930 feet of advance was completed in the year. Diamond-drilling consisted of 20 holes, totalling 5,363 feet, from underground and 4 holes, totalling 3,156 feet, from surface. A change-house, machine shop, office, and powder magazine were erected.

The average number of employees was 8: 5 underground, and 3 on surface. G. R. Cunningham-Dunlop 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, vice-president and managing director; W. N. Millar, D. R. Derry, and J. B. Aird, directors; George Baker, secretary; D. A. Macfarlane, treasurer. The head office is at 335 Bay Street, Toronto 1. The mine address is Box, 530, Cobalt.

The company leased the King Edward property from United Cobalt Mines in early 1960. This property consists of six claims in Coleman township, District of Timiskaming, on the west side of Cross Lake, about 1½ miles east of Cobalt.

Underground operations continued throughout 1961.

The vertical, two-compartment, King Edward winze, collared at adit elevation on the Watts claim, was sunk 280 feet in 1961, to a vertical depth of 1,135 feet below the collar. The second level was established 1,092 feet below the collar. Development footages consisted of 835 feet of crosscuts on the first level, and 560 feet on the second level. Some 12 diamond-drillholes, totalling 5,197 feet, were completed from underground. New construction consisted of an addition to the dry (10 x 8 ft., frame construction, shiplap covered). A double-drum hoist (Canadian Ingersoll-Rand, 45 x 30 in., PE-1, 8,000 lb. rope pull, with 75 hp. electric motor) was installed.

The average number of employees was 14: 13 underground, and 1 on surface. E. C. Rudd was mine manager.

Rockzone Mines Limited

Rockzone Mines Limited was incorporated in March 1960, with an authorized capitalization of 4,000,000 shares of \$1 par value, of which 1,333,852 shares have been issued. The directors and officers were: J. R. Nevison, president and director; W. Bishop, secretary-treasurer and director; O. J. D. Ross and Michael Ogden, directors. The head office is at 19 Melinda Street, Toronto 1. The mine address is Cobalt.

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The company has acquired the former Smith-Cobalt property consisting of about 720 acres in Coleman township, adjoining the Cross Lake-O'Brien holdings of Deer Horn Mines Limited on the east.

During the summer of 1961 the surface buildings were rehabilitated; a 16-foot, one-compartment headframe was constructed over the vertical, three-compartment No. 1 shaft, 410 feet deep, located on claim No. 654. The shaft was dewatered to the 400-foot level, a small service hoist installed, and the manway was retimbered. A geological examination of the lateral workings followed, and a start was made to dewater the winzes below the 400-foot level. Two diamond-drillholes, totalling 277 feet, were completed from underground.

Michael Ogden, director, was in charge at the property, and four men were employed.

Silvermaque Mining Limited

Silvermaque Mining Limited was incorporated in July 1961, with an authorized capitalization of 4,000,000 shares of \$1 par value, of which 2,660,892 shares have been issued. The directors and officers were: J. D. Bateman, president and director; A. D. Hellens, vice-president and director; G. B. Hellens, M. Bruce, H. Wilton-Clark, and P. H. McCloskey, directors; V. N. Harbinson, secretary-treasurer. The head office is at 132 St. James Street West, Montreal, Que. The mine address is Cobalt.

Silvermaque Mining Limited commenced a development program on the Mayfair property.¹ The property consists of 340 acres, in lot 2, concession II, in the southeast corner of Coleman township, District of Timiskaming, and extends westward across the Coleman township boundary into Block 6 of the Gillies Limit.

The surface plant was complete, but it was necessary to retimber the shaft collar and much of the lower part of the headframe. The vertical, two-compartment No. 1 shaft, on claim No. 304, Coleman township, is 420 feet deep. The two-compartment, 19-degree inclined, No. 3 winze was collared on the 400-foot level, about 1,500 feet west of the shaft and runs to a vertical depth of 557 feet below surface. Operations commenced on 19 June 1961 and were continuing at the year's end. On completion of the dewatering of the shaft and winze some lateral work was carried out. Some 10 diamond-drillholes, totalling 3,209 feet, were completed from underground.

New equipment added included: an aluminium cage (Mining Machinery Co.); a mucking machine (Eimco 12B); a generator set (Russel Hipwell, 5-kw.); 2 rock drills (Gardner Denver F.L.63); an air trammer (Universal Dredge, 36 x 84 in.); 12 muck cars (Wabi Iron, S. & E., 1 ton).

The average number of employees was 4: 2 underground, and 2 on surface. F. G. Chitty was superintendent.

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:

¹See: *Mining Operations in 1957*; Ontario Dept. Mines, Vol. LXVII, 1958, pt. 2, p. 135.

Murray Cooper, president and director; R. K. Hart, vice-president and director; M. C. Hill, J. D. Streit, Murray Watts, F. M. Fell, and E. F. Dodge, directors; J. M. Wainberg, treasurer and 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. Production in 1961 was obtained from the company's Kerr Lake dump and the Conisil underground workings. Ore is trucked a distance of 4 miles to the La Rose mill.

CONISIL PROPERTY

Silver-Miller Mines Limited acquired, in 1960, an option to purchase claims held by Conisil Mines. The property, consisting of 95.45 acres, adjoins the Lawson mine on the southwest.

Operations underground continued throughout 1961.

The vertical, two-compartment Conisil shaft, located on claim J.B.27, was sunk 153 feet in 1961, to a depth of 625 feet below surface. The 535- and 610-foot levels were established. Development work in 1961 consisted of 1,405 feet of drifting, 355 feet of crosscutting, and 546 feet of raising. Total development footage to 31 December 1961 was as follows: 2,233 feet of drifts; 518 feet of crosscuts; 827 feet of raises. Some 55 diamond-drillholes, totalling 10,834 feet, were completed in 1961, from underground.

A total of 6,320 tons of ore was hoisted and milled.

KERR LAKE PROPERTY

The Kerr Lake property consists of 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.

A total of 48,925 tons from the Kerr Lake dump was treated in the La Rose mill.

LAWSON MINE

Operations at the Lawson mine, which consists of one claim in Coleman township, continued in 1961.

SHAFTS, LAWSON MINE

| | Location | Inclination | Number of Compartments | Depth |
|------------------|---|-------------|------------------------|-------------|
| No. 8 shaft..... | SW.¼ of N.½, lot 3, con. IV, Coleman twp. | Vertical | 2 | feet 410 |
| Main shaft..... | SW.½ of N.½, lot 3, con. IV, Coleman twp. | Vertical | 2 | 195 |

Development work in 1961 consisted of 144 feet of drifting. Total development footage to 31 December 1961 was as follows: 19,669 feet of drifts, 2,816 feet of crosscuts, 4,974 feet of raises.

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The following is taken from the manager's report for the year ending 30 April 1961:

Milling and Production

| | | |
|--|---------|------------|
| Milled..... | tons | 55,247 |
| Calculated heads (oz. silver per ton)..... | oz. | 9.78 |
| Mill residues (oz. silver per ton)..... | oz. | 0.85 |
| Recovery..... | percent | 91.31 |
| Total recovered, mill..... | | 504,820.28 |
| Hand-picked high-grade ore (oz. silver)..... | oz. | 23,866.30 |
| Over-all silver production (oz. silver)..... | oz. | 528,686.58 |

Average calculated heads of underground ore milled was 31.53 ounces silver per ton, and that from the old Kerr Lake surface dump averaged 6.19 ounces silver per ton.

The mill operated efficiently throughout the year, handling an average of 197 tons per running day. Average cost per ton milled was \$1.83.

High-grade concentrates produced, averaged 2,916 ounces silver per ton, while the low-grade of flotation averaged 318 ounces per ton.

Some 33 percent of the silver contained in the high-grade concentrate was recovered in the form of metallic silver, which was melted down by Temiskaming Testing Laboratories and shipped as base bullion.

Mine Operating Costs

| | Per Ton Milled | Per Ounce Produced |
|--|----------------|--------------------|
| Shipping, refining, and marketing..... | \$0.89 | \$0.090 |
| Mining..... | 1.77 | 0.187 |
| Milling..... | 1.83 | 0.192 |
| Development..... | 1.64 | 0.171 |
| Larose maintenance..... | 0.29 | 0.031 |
| Total Mine Operating Cost..... | \$6.42 | \$0.671 |

The substantial tonnage of surface-dump ore, which was recovered and milled at small cost, largely accounts for the exceptionally low cost per ton figure shown.

The average number of employees was 37: 14 underground, and 23 on surface. On 1 November 1961, H. B. McLean succeeded E. A. Pearson as manager.

Siscoe Metals of Ontario Limited

Siscoe Metals of Ontario Limited is a wholly owned subsidiary of Siscoe Mines Limited, incorporated in September 1950. The directors and officers were: J. B. Lynch, president and director; J. G. Ahern, E. E. Campbell, A. H. Campbell, C. A. Robinson, and J. P. Crete, directors; A. P. Garratt, assistant to the president; C. M. Masterman, secretary-treasurer; H. L. Ralph, accountant. The head office address is 421 Dominion Square Building, Montreal 2, Que. The mine address is O'Brien.

The company owns and operates the Siscoe Metals property, formerly the Miller Lake-O'Brien mine, comprising fourteen claims in Nicol and Haultain townships, Gowganda area, District of Timiskaming.

Mining and milling continued throughout 1961. 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-foot level) | R.S.C.91 | 75° | 2 | 457 |
| No. 2 winze (below 350-foot level) | R.S.C.91 | 82° | 2 | 460 |
| No. 3 winze (below 350-foot level) | R.S.C.91 | 76° | 2 | 405 |
| No. 4 winze (below 350-foot level) | R.S.C.91 | 82° | 2 | 525 |
| No. 5 winze (below 525-foot level) | R.S.C.91 | Vertical | 2 | 650 |
| No. 7 winze (below 730-foot level) | R.S.C.91 | 75° | 2 | 908 |
| No. 8 winze (below 730-foot level) | R.S.C.92 | 68° | 2 | 790 |
| No. 9 winze (below 730-foot level) | R.S.C.91 | Vertical | 3 | 908 |
| No. 11 winze (below 850-foot 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 1961 consisted of 3,974 feet of drifting, 927 feet of crosscutting, and 798 feet of raising. Total development footage by present operators to 31 December 1961 was as follows: 66,429 feet of drifts; 16,845 feet of crosscuts; 6,056 feet of raises. Diamond-drilling in 1961 consisted of 147 holes, totalling 17,310 feet, from underground.

New construction in 1961 was as follows:

- 1 water tank (wood-stave (fir), 16 x 16 ft.).
- 1 pumphouse (wood frame, 10 x 12 ft., aluminium sheeting).
- 1 geology room addition (wood frame, 30 x 12 ft.).
- 1 cookery addition (wood frame, 30 x 12 ft.).
- 1 ore bin at mill (wood, 32 x 20 x 16 ft.).

New equipment added included the following:

- 1 loader (Eimco, 12-B).
- 3 rock drills (Atlas Copco BBD-W50).
- 2 rock drills (Joy Mfg., AL-47).
- 2 stopers (Canadian Ingersoll-Rand, VR 38D).

The following is taken from the mine manager's report for the year ending 31 December 1961:

Milling

| | 1961 | 1960 |
|--|-----------|-----------|
| Ore treated tons | 67,215 | 64,534 |
| Calculated heads per ton oz. | 20.50 | 21.58 |
| Mill residues per ton oz. | 0.68 | 0.62 |
| Percentage recovery percent | 96.70 | 97.14 |
| Total recovered, mill oz. | 1,332,128 | 1,352,977 |
| Hand-picked mine ore oz. | 88,994 | 67,167 |
| Over-all Silver Production oz. | 1,421,122 | 1,420,144 |

The mill operated efficiently throughout the year, handling an average of 238 tons per operating day. Including hand picked high-grade, over-all recovery in high-grade form accounted for 86 percent of total production, distributed as shown:

| SILVER IN: | PERCENTAGE OF TOTAL PRODUCTION |
|-----------------------------------|--------------------------------|
| Hand picked high-grade | 6 |
| High-grade concentrates | 80 |
| Flotation concentrates | 14 |

100

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Mining

SOURCES OF ORE FROM THE MINE TO THE MILL

| From | 1961 | | | 1960 | | |
|------------------------------------|--------|----------------|--------------|--------|----------------|--------------|
| | Tons | Ounces Per Ton | Total Ounces | Tons | Ounces Per Ton | Total Ounces |
| Development | 8,188 | 22.02 | 180,278 | 4,032 | 16.12 | 65,007 |
| Mining | 59,027 | 21.02 | 1,240,844 | 60,502 | 22.40 | 1,355,137 |
| Waste rock (to backfill) | 10,412 | — | — | 12,432 | — | — |
| Broken-ore reserves | 14,866 | — | — | 10,788 | — | — |

Mining operations were satisfactory in all sections. Of the tonnage broken in development headings, 44 percent was of ore grade. Of the total ore hoisted, 37 percent came from levels above the 900-foot level, and the balance from No. 11 winze workings.

Operating Costs

| | 1961 | | 1960 | |
|--|----------------|---------------|----------------|----------------|
| | Per Ton | Per Ounce Ag | Per Ton | Per Ounce Ag |
| Marketing (including smelting) | \$ 2.10 | \$0.099 | \$ 2.06 | \$0.094 |
| Exploration and development | 2.04 | 0.096 | 2.04 | 0.093 |
| Mining | 5.60 | 0.264 | 5.74 | 0.260 |
| Milling | 1.71 | 0.080 | 1.63 | 0.074 |
| Refining | — | — | 0.23 | 0.010 |
| Mine overhead | 1.30 | 0.061 | 1.39 | 0.063 |
| Total Mine Operating Cost | \$12.75 | \$0.60 | \$13.09 | \$0.594 |

The average number of employees was 98: 67 underground, and 31 on surface. E. A. Pearson 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; E. B. Gillanders, A. F. Lowell, D. J. McParland, W. J. Rave, and J. L. Smart, directors; George Baker, secretary; B. A. Howard, treasurer; G. R. Devey, assistant secretary; J. W. Hamilton, assistant treasurer. The head office is at 335 Bay Street, Toronto 1. The plant address is Box 190, Elliot Lake.

The thorium crude section at the Rio Algom Quirke mine did not operate for several months in early 1961, owing to the closing of that mine. This section and a research pilot plant were constructed in the mill at the Rio Algom Nordic mine. The plant is designed to produce a thorium concentrate from treatment of the

Rio Algom Nordic mill tailings, using a solvent extraction process. The final thorium processing stage is still completed at the Rio Algom Quirke mine. In 1961 an emission spectrograph for research was purchased and installed.

The average number of employees was 30. J. L. Hopkins was plant superintendent, and M. E. Grimes was research manager.

URANIUM

There was a decrease of 24.37 percent in the quantity, and a decrease of 28.74 percent in the value of production, compared with 1960. The industry paid \$3,561,582 to 589 salaried personnel, and \$21,151,391 to 3,847 wage-earners. Fuel and electricity used cost \$3,816,413, and process supplies cost \$18,733,139.

Denison Mines Limited

Denison Copper Mines Limited was incorporated in November 1936. It was succeeded in 1946 by Denison Nickel Mines Limited. In 1949 the name was changed to North Denison Mines Limited. In March 1954, it was again changed to Consolidated Denison Mines Limited. In March 1960, on amalgamation of Consolidated Denison Mines Limited and Can-Met Explorations Limited, the name was changed to Denison Mines Limited. The authorized capitalization is 6,000,000 shares of \$1 par value, of which 4,474,703 shares have been issued. The directors and officers were: S. B. Roman, president and director; A. W. Stollery and H. A. Willis, vice-presidents and directors; F. H. Jowsey, B. E. Willoughby, J. F. Crothers, J. S. Williams, G. C. Knowles, and L. R. Perini, directors; John Kostuik, vice-president and general manager; J. C. Puhky, secretary-treasurer; E. B. McConkey, assistant secretary-treasurer. The head office is at 4 King Street West, Toronto 1. The mine address is P.O. Box B-2600, Elliot Lake.

The Denison property consists of eighty-eight claims in Townships 144 and 150, Blind River area, District of Algoma.

SHAFTS, DENISON MINE

| | Claim No. | Inclination | Number of Compartments | Total Depth from Surface |
|-------------------|-----------|-------------|------------------------|--------------------------|
| No. 1 shaft | S.86071 | Vertical | 5 | feet 1,856 |
| No. 2 shaft | S.86118 | Vertical | 8 | 2,776 |

Development work in 1961 consisted of 18,007 feet of drifting. Total development footage on a single plane to 31 December 1961, was as follows: 127,687 feet of drifting; 1,611 feet of raising. Some 1,656 diamond-drillholes, totalling 36,887 feet, were completed in 1961 from underground.

New construction in 1961 consisted of an addition to the mine-air heating plant (16 x 34 x 20 ft. high, concrete-block structure, 20-year bonded roof); a recycling water-tank house (24 x 24 x 26 ft. high, frame structure, asbestos shingle siding).

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Major equipment added was as follows: a direct oil-fired warm-air central heater (Arthur A. Olson, Canfield, Ohio, U.S.A., capacity 4,000,000 Btu. per hour) to mine-air heating plant; water softening equipment, including all necessary piping, platforms, and controls, in the boiler house; installation for the recycling of neutral water between the concentrator and grinding plant.

The following is taken from the vice-president's and general manager's report for the year ending 31 December 1961:

The year 1961 has seen progressive attainment of the production and performance targets set at the end of the previous year. The concentrator operated at capacity throughout the year, with the exception of the annual holiday shut-down taken this year in the last week of July and the first week of August. A marked improvement in the grade of ore treated, from 2.70 pounds U_3O_8 per ton in 1960 to 2.85 pounds U_3O_8 per ton in 1961, was accompanied by a reduction in operating and capital costs. A major success in accident prevention rounded out the highlights.

Mining

A total of 2,032,911 tons was hoisted; 964,436 tons from No. 1 shaft, 1,068,475 tons from No. 2 shaft. A total of 53,941 linear feet was driven, in headings of various sizes, 97 percent in ore. Positive reserves of 2,800,000 tons with a known grade were maintained.

Conveyor extensions totalled 1,179 feet. The first 600 feet of the northeast conveyor axis was being erected at the year's end. Axis A, the present north-south conveying system between the two shafts, will have reached its limits of economic haulage late in 1962. In view of this, a new north-south system, Axis B, has been commenced some 3,100 feet from Axis A. It is scheduled for completion in 1963, and through it will be conveyed several years' production.

Approximately one-third of all ore was scraped directly from stopes to conveyors for transportation to the production shafts. This has proven to be an efficient, low-cost haulage method. Mining costs were 5 percent per ton or 11 percent per pound U_3O_8 lower in 1961 than in 1960.

Cost savings will continue as a result of refinement of maintenance standards, with methods improvements in development headings, in conveying and scraping, and with the conversion of the mine to the use of AN.FO (ammonium nitrate—fuel oil) blasting agents.

Rock mechanics studies have enabled the engineering staff to plan layouts on a sound technical basis, and this work will be broadened.

The primary fans have been relocated at No. 1 shaft to improve effectiveness of the ventilation system. An additional heating plant (4,000,000 Btu.) was erected at No. 2 shaft to handle the increased air-flow.

Milling

A total of 2,033,483 dry tons of ore was treated for a daily average of 5,827 dry tons, as compared with 5,787 dry tons for 1960. Average recovery increased to 93.18 from 93.04 percent.

Cost savings of 9 percent per ton of ore or 15 percent per pound U_3O_8 were gratifying; these were accomplished as a result of a decrease in reagent consumption, based upon studies by the metallurgical staff, as well as in the cost of maintenance labour and supplies. Metallurgical test work will be intensified to further reduce reagent costs.

The average number of employees was 1,229: 764 underground, and 465 on surface. M. J. de Bastiani was mine manager.

Faraday Uranium Mines Limited

Faraday Uranium Mines Limited was incorporated in June 1949, with an authorized capitalization of 5,000,000 shares of \$1 par value, of which 4,405,910 shares have been issued. The directors and officers were: A. W. Johnston, president and director; William McKee, secretary-treasurer and director; A. B. White-law, W. C. Campbell, G. L. Jennison, L. E. Wetmore, and J. K. McCausland, directors; W. M. O'Shaughnessy, assistant secretary-treasurer. The head office is at 100 Adelaide Street West, Toronto. The mine address is Bancroft, R.R. No. 3.

The property consists of eight claims, in Faraday township, Hastings county.

SHAFTS, FARADAY MINE

| | Location | Inclination | Number of Compartments | Total Depth below Adit Level |
|-----------------------|----------------------------------|-------------|-----------------------------------|------------------------------|
| No. 1 shaft | Lot 16, con. XI, Faraday twp. | Vertical | 3 to 750 feet 4 below 750 feet | feet |
| No. 2 shaft | | | | 1,455 |
| | Lot 17, con. XI, Faraday twp. | Vertical | 3 | 196 |

Development work in 1961 consisted of 3,811 feet of drifting, 1,449 feet of crosscutting, and 3,849 feet of raising. Total development footage to 31 December 1961 was as follows: 48,835 feet of drifts; 31,656 feet of crosscuts; 37,501 feet of raises. Diamond-drilling in 1961 consisted of 232 holes, totalling 34,712 feet, from underground.

The following is taken from the mine manager's report for the year ending 31 December 1961:

Development

It was found possible to effect a considerable reduction in the amount of development work carried out during the year with only a minor reduction in the pounds of uranium contained in the ore reserves.

Development work was distributed 26 percent above the 600-foot level and 74 percent on the 750- and 900-foot levels. There was no exploration below the 900-foot level, except for limited diamond-drilling done to confirm the downward extension of proven ore zones.

Ore Reserves

Ore reserves show a decrease in over-all tonnage due to the reduction in the amount of development work carried out. The grade of the remaining tonnage, however, shows a marked improvement, so that the total poundage of uranium oxide in sight is down by less than 10 percent. Detailed development of individual ore blocks has permitted transfer of considerable tonnage from the probable to the proven category.

Approximately 53 percent of the solid reserves are on the 750- and 900-foot levels, within a 1,000-foot radius of the shaft.

Less than 10 percent of the total ore reserves are calculated below the 900-foot level. This leaves the 750-foot and 900-foot levels only partially explored, with no lateral development on the bottom two levels.

A comparison of present reserves with those of the previous years is shown below:

| | 1 January 1962 | | 1 January 1961 | |
|--|----------------|-------------------------------------|----------------|-------------------------------------|
| | Reserves | Grade U ₃ O ₈ | Reserves | Grade U ₃ O ₈ |
| | tons | percent | tons | percent |
| Proven Ore: | | | | |
| Broken | 187,983 | 0.112 | 256,600 | 0.106 |
| Solid | 499,910 | 0.127 | 451,300 | 0.118 |
| Total proven ore | 687,893 | 0.123 | 707,900 | 0.114 |
| Probable ore | 243,400 | 0.105 | 417,000 | 0.097 |
| Total reserves | 931,293 | 0.118 | 1,124,900 | 0.107 |
| Total U ₃ O ₈ pounds | | 2,197,851 | | 2,407,286 |

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Mining

Stoping was concentrated principally above the 600-foot level, with stope preparation on the 750- and 900-foot levels accounting for 12 percent of the total ore broken.

The shape of the orebodies on the lower levels, combined with the emphasis on grade control, encouraged a trend away from shrinkage-stoping to cut-and-fill stoping methods. It is planned to mine most of the ore below the 600-foot level by the cut-and-fill method.

Total ore broken was 282,334 tons, compared with 513,934 tons in 1960. Broken reserves were reduced from 256,600 tons, grading 0.106 percent U_3O_8 , to 187,973 tons, grading 0.112 percent U_3O_8 .

Milling

The mill treated 339,659 tons for an average of 931 tons per calendar day. Tonnage treated per milling day in the 44-hour week schedule was 1,268.

Metallurgy remained fairly uniform. Increased mill-heads accounted for a small increase in tailings losses, but recovery remained over 95 percent.

Unit cost per ton milled increased with the reduced throughs, but unit costs per pound of U_3O_8 produced were the lowest recorded to date. Comparative milling statistics are as follows:

| | 1961 | 1960 | 1959 | 1958 | 1957 ⁽¹⁾ |
|--|---------|---------|---------|---------|---------------------|
| Milled tons | 339,659 | 468,939 | 537,594 | 491,826 | 280,668 |
| Milled per day tons | 931 | 1,282 | 1,473 | 1,347 | 1,160 |
| Heads, U_3O_8 percent | 0.122 | 0.100 | 0.087 | 0.092 | 0.086 |
| Tails, U_3O_8 percent | 0.006 | 0.0049 | 0.0040 | 0.0056 | 0.0068 |
| Recovery percent | 95.06 | 95.11 | 95.34 | 94.00 | 91.90 |
| Precipitate grade U_3O_8 percent | 74.50 | 76.14 | 75.66 | 70.50 | 67.10 |

⁽¹⁾Eight months only.

Costs

Operating costs per ton milled are above those of 1960 owing to reduced tonnage treated. Comparative cost figures are tabulated below:

| | 1961 | 1960 | 1959 | 1958 | 1957 ⁽¹⁾ |
|-----------------------|--------|--------|--------|---------|---------------------|
| Development | \$1.39 | \$1.40 | \$2.12 | \$ 2.54 | \$ 2.34 |
| Mining | 4.31 | 4.35 | 3.96 | 4.41 | 3.77 |
| Milling | 3.47 | 2.96 | 3.00 | 3.05 | 3.94 |
| Total | \$9.17 | \$8.71 | \$9.08 | \$10.00 | \$10.05 |

⁽¹⁾Eight months only.

The average number of employees was 316: 168 underground, and 148 on surface. D. R. Wilson was mine manager.

Macassa Gold Mines Limited (Bicroft Division)

Bicroft Uranium Mines Limited was formed in April 1955, as an amalgamation of Centre Lake Uranium Mines Limited and Croft Uranium Mines Limited. The authorized capitalization was 4,000,000 shares of \$1 par value, of which 3,057,475 shares had been issued. On 1 November 1961, Bicroft Uranium Mines Limited and Macassa Mines Limited were amalgamated under the name of Macassa Gold Mines Limited. Details of the amalgamation and the officers and directors are given in the Gold section of this report, under Macassa Gold Mines Limited. The mine address of the Bicroft Division is R.R. No. 3, Bancroft.

The Croft properties are in Cardiff township, Haliburton county, and in Faraday and Herschel townships, Hastings county. The Centre Lake property is in Cardiff township.

Operations at the Centre Lake property continued throughout 1961.

SHAFTS, CENTRE LAKE MINE

| | Location | Inclination | Number of Compartments | Total Depth from Surface |
|-----------------------|---|-------------|------------------------|--------------------------|
| No. 1 shaft | Claim E.O.5936; N½, lot 27, con. XI, Cardiff twp. | Vertical | 3 | 234 |
| No. 2 shaft | | Vertical | 5 | 1,843 |

No. 2 shaft was sunk a further 409 feet in 1961, to a depth of 1,843 feet below surface; the 12th and 13th levels were established at depths of 1,499 and 1,649 feet, respectively, below the collar.

Development work in 1961 consisted of 8,958 feet of drifting, 6,678 feet of crosscutting, and 14,654 feet of raising. Total development footage to 31 December 1961 was as follows: 65,602 feet of drifts; 52,808 feet of crosscuts; 65,311 feet of raises. Diamond-drilling in 1961 consisted of 359 holes from underground, totalling 52,675 feet.

The following is taken from the annual report for the year ending 31 December 1961:

Production

The data tabulated below summarizes operating results in 1961, the fifth year of production, with comparative data for the preceding two years.

| | 1961 | 1960 | 1959 |
|--|---------|---------|---------|
| Hoisted tons | 388,096 | 454,232 | 471,321 |
| Average per day tons | 1,063 | 1,243 | 1,291 |
| Discarded in sorting plants tons | 52,142 | 52,355 | 46,948 |
| Average discarded per day tons | 142 | 143 | 129 |
| Milled tons | 336,618 | 404,682 | 424,373 |
| Average milled per day tons | 923 | 1,110 | 1,162 |
| Recovery per ton milled | \$19.97 | \$20.06 | \$19.53 |
| Recovery percent | 94.3 | 94.3 | 92.9 |
| Grade of mill feed | \$21.18 | \$21.27 | \$21.02 |

Operating Costs

| | Per Ton Milled | | |
|--------------------------------|----------------|---------|---------|
| | 1961 | 1960 | 1959 |
| Development | \$ 2.34 | \$ 2.53 | \$ 1.96 |
| Mining | 5.09 | 4.58 | 4.33 |
| Milling | 3.15 | 3.26 | 3.64 |
| General mine expense | 0.85 | 1.07 | 0.80 |
| Total Cost | \$11.43 | \$11.44 | \$10.73 |

For comparative purposes, there was included in 1960 general mine expense the sum of about \$23,000.00 expended on outside exploration. This has not been included in the 1961 figures.

Milling

Feed to the crusher plant totalled 336,618 tons for an average of 966 tons per day. A total of 98,287 tons (24.3 percent) of this feed was processed in the sorting plant and 52,142 tons (53.1 percent) was discarded as waste. The discarded tonnage therefore represented 15.5 percent of ore hoisted. The sorting process upgraded the ore by an average of 11 percent.

The mill operated at an average rate of 923 tons of sorted ore per day. The over-all recovery was 94.3 percent, the same as in 1960. The milling cost per ton was reduced by 11 cents, in spite of a lower tonnage milled during the last four months of the year, in order to not over-produce the contract requirements.

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Mining

By the year's end all known ore, down to the sixth level had been extracted. There remains some ore on the seventh level to recover, and development work was pushed on the eighth, ninth, tenth, eleventh, twelfth, and thirteenth levels, following the completion of shaft sinking on 1 May.

Stoping

Operations during the year, and to date, are briefly summarized below:

| | 1961 | 1960 | 1959 |
|---------------------------------|---------|---------|---------|
| Broken..... tons | 300,075 | 362,191 | 389,496 |
| Drawn..... tons | 327,497 | 370,946 | 402,988 |
| Ore hoisted..... percent | 77.3 | 81.9 | 85.1 |
| Broken ore reserves..... tons | 31,863 | 56,627 | 75,382 |
| Number of stopes worked..... | 271 | 213 | 168 |
| Number of stopes completed..... | 165 | 110 | 103 |
| Number of stopes started..... | 135 | 142 | 87 |

The average stoping length during the year was 35 feet, having an average width of 6 feet. During the year, 33,463 tons of development and sorting-plant waste were used as stope backfill.

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. However, based on our past five years' experience in mining this ore zone, the fact that there has been remarkable uniformity in the tons per vertical foot developed on each level throughout the mine, and that there has been no change in the structure on the newest levels, it is anticipated that there will be no problem in developing additional reserves to cover all present and future commitments. At the year's end the broken reserves totalled 31,863 tons. This is an increase from 15 October, when broken reserves totalled about 5,000 tons.

The average number of employees was 488: 301 underground, and 187 on surface. J. M. Thompson, the mine manager, died suddenly 30 December 1961; J. D. Bryce, executive vice-president, was in charge prior to the appointment of G. A. Howes as mine manager.

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 are 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 10,612,132 shares have been issued. The directors and officers were: Hon. R. H. Winters, president and director; W. H. Bouck, Henry Borden, F. G. Gardiner, Sam Harris, Leo Model,

F. Petito, J. N. V. Duncan, C. C. Calvin, J. G. Edison, E. B. Gillanders, Hon. S. A. Hayden, Sir Mark Turner, J. H. Smith, and R. W. Wright, directors; George Baker, secretary; W. B. Malone, treasurer; D. A. Macfarlane assistant treasurer; G. R. Davey, 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. Details on the Rio Algom Mines Limited, Pronto Division, Pater mine appears in the NICKEL-COPPER section of this report.

ALGOM DIVISION

The property consists of some 283 claims in the Blind River area, District of Algoma. Two mines, the Nordic and the Quirke, were being operated.

Nordic Mine

Mining and milling operations continued throughout 1961 at the Nordic mine, in Townships 143, 149, and 155.

The vertical, six-compartment, Nordic No. 1 shaft, located on claim S.66619, in Township 149, was sunk a further 449 feet to a total depth of 1,780 feet below the collar. Nos. 10, 11, 12, 13, and 14 levels, and No. 3 crusher station, loading-station, spill chute, and the bottom pumping station were established at depths of 1,054, 1,153, 1,230, 1,314, 1,391, 1,510, 1,643, 1,720, and 1,762 feet, respectively. Development work in 1961 consisted of 7,737 feet of drifting, 3,783 feet of cross-cutting, and 19,067 feet of raising. Total development footage to 31 December 1961 was as follows: 65,287 feet of drifts; 13,119 feet of crosscuts; 111,802 feet of raises. Some six diamond-drillholes, totalling 2,978 feet, were completed from underground, and four holes, totalling 3,089 feet, were drilled from surface.

New construction included a thorium plant (150 x 70 ft.) and a pilot plant (50 x 30 ft.), both constructed inside the existing concentrator building and having side walls (2-in. T and G) with corrugated asbestos siding. The skip-hoist conversion, to increase the hoisting speed from 1,000 to 1,750 feet per minute, was completed by Canadian General Electric and Canadian Ingersoll-Rand. This consisted of the addition of bigger drive pinions; a second motor (600-hp., 450 rpm.); change of hoist controls from manual to semi-automatic; replacing the model D Lilly controllers with model C; replacing the falling-weight brakes with pressure-applied-pressure-released brakes. A mobile crane (Dominion, TM-25, 25-ton capacity, International Harvester) was added equipment.

A total of 1,121,635 tons of ore was hoisted; 1,124,000 tons was milled; the mill averaged 3,202 tons daily.

The average number of employees was 616: 316 underground, and 300 on surface. G. M. Godfrey was mine manager.

Quirke Mine

The Algom Quirke mine, consisting of 140 claims, adjoins the north boundary of the Denison Mines property. 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.

There was no production or development ore hoisted at the Quirke mine in 1961. A small crew worked underground from 1 January to 15 March salvaging equipment and supplies. The mill bins and circuit were cleaned from 1 to 26 January, and some 8,726 tons was milled; the mine was placed on a stand-by basis. However, towards the end of the year it was decided that the stand-by

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facilities were unnecessary; the underground crusher and pumps were removed, and the mine allowed to flood; it was kept on a more economical care-and-maintenance basis.

The following table gives the accumulated development footages at the time of closure, 15 March 1961.

| Level | Accumulated Totals | | |
|--------------------|--------------------|-----------|-----------------------------------|
| | Drifts | Crosscuts | Raises (excluding boxholes) |
| | feet | feet | feet |
| No. 1..... | 5,680 | 979 | 9,911 |
| No. 2..... | 8,614 | 870 | 16,603 |
| No. 3..... | 11,971 | 1,498 | 15,721 |
| No. 4..... | 9,252 | 835 | 8,577 |
| No. 5..... | 9,599 | 1,167 | 11,308 |
| No. 6..... | 13,979 | 4,206 | 17,085 |
| No. 7..... | 9,703 | 2,705 | 14,361 |
| No. 8..... | 5,126 | 1,899 | 4,703 |
| No. 9..... | 823 | 3,189 | 1,002 |
| Crusher No. 2..... | — | 477 | 271 |
| No. 10..... | — | 1,951 | — |
| L.P. No. 2..... | — | 47 | 220 |
| No. 11..... | — | 47 | — |
| Spill..... | — | 54 | 27 |
| Total..... | 74,747 | 19,924 | 99,789 |

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 1961.

SHAFTS, MILLIKEN LAKE MINE

| | Location | Inclination | Number of Compartments | Total Depth from Surface |
|-------------------------------|----------|-------------|---------------------------|-----------------------------|
| No. 1 shaft (service)..... | S.80247 | Vertical | 2 | feet 3,071 |
| No. 2 shaft (production)..... | S.80247 | Vertical | 3 | 3,400 |

No. 276 south service raise was driven a further 540 feet for a total length of 1,852 feet; the 2,600-foot level was established.

Development work in 1961 consisted of 5,818 feet of drifting, 402 feet of crosscutting, and 22,263 feet of raising. Total development footage, corrected to 31 December 1961, was as follows: 37,260 feet of drifts; 8,721 feet of crosscuts; 107,764 feet of raises. Diamond-drilling in 1961 consisted of 2,115 holes, totalling 25,630 feet, from underground and one hole, 431 feet deep, from surface.

A total of 1,109,884 tons of ore was hoisted; 1,110,977 tons was milled at an average of 3,044 tons daily.

The average number of employees was 559: 295 underground, and 264 on surface. W. P. Arnold was general manager; E. R. Olson was mine manager.

NORTHSPAN-PANEL DIVISION

The properties include the Lacnor mine (formerly called the Lake Nordic mine), 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; and the Lacnor mine in June 1960.

Panel Mine

The Panel mine, consists of 36 claims in Township 144, District of Algoma. Mining operations proceeded from 1 January to 28 June; milling from 1 January to 30 June. The mine was allowed to flood, and the property was also on a care-and-maintenance basis. The mine was developed through two shafts, which were sunk on two islands close to the north shore of Quirke Lake. No. 1 island has now been joined to the mainland by a causeway.

SHAFTS, PANEL MINE

| | Claim No. | Inclination | Number of Compartments | Total Depth from Surface |
|--------------------------------|-----------|-------------|------------------------|--------------------------|
| No. 1 shaft (production)..... | S.67629 | Vertical | 6 | feet 1,836 |
| No. 2 shaft (ventilation)..... | S.67630 | Vertical | 3 | 1,250 |

The following table shows the development footages in 1961 and the accumulated totals at time of closure:

| Level | Drifts | | Crosscuts | | Raises (excluding boxholes) | |
|-------------|--------|--------|-----------|--------|-----------------------------|--------|
| | 1961 | Total | 1961 | Total | 1961 | Total |
| No. 1..... | — | — | — | 566 | — | 481 |
| No. 1A..... | — | — | — | — | — | 60 |
| No. 2..... | — | 1,494 | — | — | — | 1,350 |
| No. 3..... | 386 | 5,921 | — | 535 | 70 | 4,507 |
| No. 4..... | 80 | 7,260 | 43 | 5,890 | 1,392 | 11,194 |
| No. 5..... | 410 | 6,282 | — | 3,479 | 1,669 | 13,881 |
| No. 6..... | 343 | 6,002 | 48 | 4,388 | 2,155 | 13,700 |
| No. 7..... | — | 2,679 | — | 518 | — | 3,529 |
| No. 8..... | — | 4,796 | — | 559 | — | 7,435 |
| No. 9..... | 172 | 554 | 82 | 3,223 | 1,995 | 7,366 |
| No. 12..... | 300 | 1,490 | — | 7,125 | 532 | 4,229 |
| Total..... | 1,691 | 36,478 | 173 | 26,283 | 7,813 | 67,732 |

Diamond-drilling in 1961 consisted of 456 holes, totalling 10,435 feet, from underground.

A total of 602,724 tons of ore was hoisted: 607,218 tons was milled; the mill averaged 3,355 tons daily during the period of operation.

The average number of employees was 271: 151 underground, and 120 on surface. W. P. Arnold was general manager; G. A. Jewett was mine manager.

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The following is taken from the company's annual report for the year ending 31 December 1961:

Milling

| Year | Total Milled | Average Calculated Heads (U ₃ O ₈ per Ton) | Average Recovery Based on Average Calculated Heads |
|-----------|--------------|---|--|
| | tons | pounds | percent |
| 1961..... | 2,850,921 | 2.55 | 94.1 |
| 1960..... | 5,050,004 | 2.39 | 93.5 |
| 1959..... | 6,090,675 | 2.30 | 94.2 |

NOTE: The combined average daily milling rate of Milliken and Nordic during 1960 was 6,385 tons per day.

Sources of Ore

| Year | Development | Ore Broken Stopping | Total | Ore Hoisted |
|-----------|-------------|---------------------|-----------|-------------|
| | tons | tons | tons | tons |
| 1961..... | 318,010 | 2,549,985 | 2,866,995 | 2,837,191 |
| 1960..... | 574,992 | 4,502,670 | 5,077,662 | 5,044,188 |
| 1959..... | 1,132,639 | 5,037,875 | 6,170,514 | 6,087,766 |

Ore Reserves

| | At 31 December 1961 | | | | | |
|---------------|---------------------|--|---|--|---|--|
| | Proven Ore | | Probable Ore | | | |
| | | | As Disclosed by Under-ground Development ⁽¹⁾ | | As Disclosed by Diamond-Drilling ⁽²⁾ | |
| | tons of ore | pounds U ₃ O ₈ per ton | tons of ore | pounds U ₃ O ₈ per ton | tons of ore | pounds U ₃ O ₈ per ton |
| Milliken..... | 749,855 | 2.24 | 1,175,540 | 2.04 | 13,994,000 | 2.11 |
| Nordic..... | 638,852 | 2.96 | 487,734 | 2.84 | 2,976,962 | 2.89 |

⁽¹⁾Includes dilution based on experience; excludes permanent pillars.

⁽²⁾Tonnages and grades undiluted.

General

Proven and probable ore in the Milliken and Nordic mines is sufficient to meet deliveries under the current master contract, the Preston Mines agreement, and estimated private contract sales.

Safety and Health

The safety record was satisfactory in 1961, and compensable injuries were considerably lower than in 1960.

First-aid teams did well, and Milliken won the District Trophy. The Nordic mine rescue team won the Elliot Lake district and the provincial championships.

Work continues successfully to improve mine ventilation and dust control.

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,

N. C. Steenland, V. V. Jacomini, John Dunning, H. H. Merritt, J. C. Ward, James Bruce, 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 22 claims, about 595 acres in Township 144, Blind River area, District of Algoma.

Mining operations continued throughout 1961.

SHAFTS, STANROCK MINE

| | Claim No. | Inclination | Number of Compartments | Total Depth |
|---------------------|-----------|-------------|------------------------|---------------|
| No. 1 shaft | S.82324 | Vertical | 3 | feet 3,379 |
| No. 2 shaft | S.82323 | Vertical | 2 | 2,953 |
| Service raise | S.82323 | Vertical | 3 | 220 |

The shafts are about 800 feet apart. There is a main level from No. 1 shaft at a depth of 3,277 feet, and a main level from No. 2 shaft at a depth of 2,909 feet. A connection between the two shafts was made in 1958. There are also two adits, one leading to each shaft, in a steep hillside near the shafts. The crushing and grinding equipment and a fine-ore bin are located in chambers excavated inside the hill. The crushing and grinding operation began on 15 February 1958.

Development work during the year consisted of 9,424 feet of drifting, 78 feet of crosscutting, 647 feet of conveyorways, 368 feet of raising. Total development footage to 31 December 1961 was as follows: 85,290 feet of drifts; 2,040 feet of crosscuts; 4,393 feet of conveyorways, 3,738 feet of raises. Some 1,563 diamond-drillholes, totalling 12,151 feet, were completed in 1961 from underground.

New construction in 1961 consisted of a boiler plant ion-exchange annex (20 x 15 ft., concrete-block construction.)

New equipment installed underground included a rope belt conveyor (Goodman Mfg. Co., 700 ft. long, 48 in. wide, cap. 300 tpm.); 3 dump trucks (Le Tourneau Westinghouse, Model D, cap. 10 tons); 4 slusher hoists (Ingersoll-Rand, 30 hp., electric); and a ferric oxide dissolution plant in the concentrator building.

A total of 1,118,601 tons of ore was hoisted, 1,121,942 tons was milled, at a daily average of 3,090 tons.

The average number of employees was 680: 444 underground, and 236 on surface. F. R. Jones was mine manager.

ZINC—see LEAD AND ZINC

Non-Metallics and Fuels

ARSENIC

In 1961, 419,300 pounds of arsenic valued at \$16,772 were recovered from concentrates from the mines of the Cobalt-Gowganda area.

ASBESTOS

The quantity produced was 7.57 percent greater, and the value was 5.66 percent greater than in 1960. The general statistics for asbestos, fluorspar, gypsum, nepheline syenite, peat moss, and talc are grouped together and published here. These industries employed 109 salaried personnel and 483 wage-earners; they paid the former \$636,624 and the latter \$2,182,265. Fuel and electricity used cost \$528,096, and process supplies cost \$558,505.

Canadian Johns-Manville Company Limited

Canadian Johns-Manville Company Limited was incorporated in September 1918. It is a wholly owned subsidiary of Johns-Manville Corporation. The authorized capitalization is 25,000 shares of \$100 par value, of which 15,705 shares have been issued. The directors and officers were: K. V. Lindell, chairman and director; A. G. Sinclair, president and director; L. M. Adamson, F. A. H. Gallop, N. W. Hendry, and J. O. Eby, vice-presidents and directors; W. H. Soutar, secretary; H. W. Clarkson, treasurer; Jan Kaczkowski and D. W. Livingstone, assistant-treasurers; S. C. Allard and J. D. Wilson, assistant-secretaries. The head office is at 310 Victoria Avenue, Westmount, Montreal 6, Que. The mine address is Matheson.

The company's holdings include twenty-six claims known as the Munro mine in Munro township, and the Barton Creek mine in Beatty township, Porcupine area, District of Cochrane. No work was done at the Barton Creek mine in 1961.

Mining and milling at the Munro mine continued throughout 1961. Operations in the open pit ceased in January 1959. All mill feed in 1961 came from underground mining.

SHAFTS, MUNRO MINE

| | Claim No. | Inclination | Number of Compartments | Sinking in 1961 feet | Depth below Surface 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 | 147 | 949 |

Sinking of No. 3 internal shaft, collared on the 637-foot level, was advanced a further 147 feet in 1961 to a depth of 949 feet below surface. The 900-foot level was established 259 feet below the collar.

Development work in 1961 consisted of 3,779 feet of drifting; 1,943 feet of crosscutting; 265 feet of raising. The total development to 31 December 1961 was as follows: overburden stripped, 1,842,136 tons; 29,113 feet of drifting; 17,808 feet of crosscutting; 5,418 feet of raising. Diamond-drilling in 1961 consisted of 79 holes, totalling 15,130 feet, from underground and 31 holes, totalling 12,989 feet, from surface. The drive westerly from the 635-foot level towards the Barton Creek property was steadily advanced. Mill alterations are complete, but certain modifications were undertaken, which will better adapt the circuit to the change-over from open-pit to mine ore. A third dryer was added to handle the wetter mine ore. Two grades of asbestos fibre are now being produced. The second product is still in the testing and customer-appraisal stage.

The following new equipment was installed:

- A tailings conveyor extension (Forano, 24 in. wide, 96 ft. long).
- 2 fibre-cleaning trommels (36 x 84-in., Barberton Iron and Steel, South Africa).
- 2 air separators (72 in., Bauer Bros. Mfg. Co.).
- 5 collectors with airlock and fan (company design, two 13.25-ft., two 7-ft., one 6-ft.).
- 1 slusher (125 hp. tandem, Joy Mfg. Co.).
- 1 battery locomotive (3-ton, Atlas type B).
- 1 combination locomotive (10-ton, Goodman).
- 2 air slushers (15 hp. Joy Mfg. Co., AF-212).
- 4 air drills (Joy Model A1-47).
- 3 stopers (Joy S.A.L.).
- 2 rocker shovels (Eimco 21-35).
- 6 Granby mine cars (120-cu. ft., Dorr-Oliver-Long).
- 1 dryer fan (18-in. diameter, 7.5 hp. motor, Dryer Dynamics Corp., N.J., U.S.A.).

There were 792,375 tons of ore hoisted from underground, of which 150,695 tons was discarded. The mill treated 635,358 tons, operating at an average daily rate of 2,093 tons.

The average number of employees was 295: 93 underground, and 202 on surface. R. W. Winson was mine manager.

Hedman Mines Limited

Hedman Mines Limited was incorporated in August 1956, with an authorized capitalization of 3,000,000 shares of \$1 par value, of which 1,235,277 shares have been issued. The directors and officers were: J. J. Mangan, president and managing director; J. C. Lavigne, vice-president and director; S. E. McCrory, secretary-treasurer and director; A. H. Stanley and G. T. Evans, directors. The head office address is Box 467, Timmins. The mine address is Matheson, P.O. Box 336.

The property consists of 29 claims, about 1,164 acres, located in Warden and Munro townships, District of Cochrane, about 25 miles northeast of Matheson.

Operations continued throughout 1961, and consisted of further stripping of the asbestos orebody, the construction of a small permanent camp, the improvement of the access road to highway No. 101, and the construction of a pilot plant for bulk testing. A 20- by 40-foot, two-storey addition to the existing 40- by 60-foot pilot mill building was completed. Further new equipment added consisted of two Hazamag crushers, two screens, one bagging machine, three collectors, one fiberizer, one syntron feeder, five conveyors, one ore storage bin, one 25-kilowatt diesel-electric generator set, and additional laboratory and testing equipment.

E. W. Gagan was consulting engineer in charge of operations at the property, and 10 men were employed.

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FLUORSPAR

The value of production in 1961 decreased 61.91 percent from 1960. The general statistics for the industry are included in those given under 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 1961 was as follows: preferred, 750; common, 100,003. The officers and directors are: 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 1961 were at the South Coe Lake property. This property consists of 100 acres in the south half of lot 10, concession XIII, Huntingdon township, Hastings county. Operations commenced on 1 January, and the property was closed on 18 February 1961. The equipment was moved to storage, and the property will not be reopened in the foreseeable future.

During the period of operations the vertical, two-compartment, No. 1 shaft was collared and sunk to a depth of 42 feet. No. 1 northeast drift was established at a depth of 32 feet, and 40 feet of drifting had been completed. One diamond-drillhole 80 feet long was drilled from surface.

New construction included a headframe (12- x 6-ft., two-compartment, 40 ft. high, laminated timber construction); a hoist-room (frame construction with concrete floor, 20- x 30-ft.); and an ore-sorting building (frame construction with concrete floor, 20- x 40-ft.). A hoist (Canadian Mead Morrison, 7-in. cylinder diameter, 10-in. stroke); and an air compressor (Gardner Denver, 220 cfm.) had been installed.

The average number of employees was two; W. J. Symon, president, was in charge.

GARNET

Industrial Garnet Company Limited operated at River Valley in Gibbons township for 248 days and produced coloured aggregates for composition panels and terrazzo. They also produced some abrasives for polishing such material. The garnet they produced was used in their own plant.

Industrial Garnet Company Limited

Industrial Garnet Company Limited was incorporated in February 1958, with an authorized capitalization of 5,000 shares of no par value, of which, 2,500 shares have been issued. The officers and directors were: H. F. Wiemer, president, director, and manager; Mrs. I. J. I. Wiemer, vice-president and director; R. W. Wiemer, secretary-treasurer and superintendent. The head office and mine address is River Valley.

The company's property consists of 540 acres located in Dana, Crerar, McWilliams, and Gibbons townships, District of Nipissing.

Operations were carried on from April to December, 1961. Rough monumental stone remaining from previous operations was cut and polished for the trade. The company primarily produces stucco pebbles from the black granite, open-cut operations in the several townships near the mill. Overburden, averaging 3-4 feet in depth, was removed from about 6 acres, and a new open pit was established. One surface diamond-drillhole was completed to a depth of 50 feet.

New construction in 1961 included a second crushing and screening plant (40- x 60-ft., timber frame, 1-in. lumber sheeting); two storage sheds (one 20- x 24-ft., the second 16 x 16 ft.). New equipment installed to give a 30-tons-per-day milling capacity included: 2 jaw-crushers (Sturtevant, 9- x 13-in. and 5- x 10-in.); 1 impact crusher (Morley, 4- x 8-in.); 3 vibrating screens (Denver-Dillon, double-deck, 18- x 48-in.); 1 continuous-bucket belt conveyor.

During the period of operation, 5,500 tons of material was mined, from which 1,500 tons was sorted; the mill treated 4,000 tons, averaging 20 tons per day.

The average number of employees was five.

GYPSUM

Production of gypsum increased 19.60 percent in quantity and 13.83 percent in value over the 1960 production. For general statistics for the industry 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: C. H. Shaver, president and director; D. C. McConkey, secretary, treasurer, and director; G. A. Long, W. G. Parsons, T. R. McCleary, and R. L. Jackson, vice-presidents and 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 own or hold 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, in lot 15, a vertical two-compartment, ventilation and escapement shaft, 90 feet deep, known as No. 2. In 1959, No. 3 shaft, a vertical, two-compartment, ventilation and escapement shaft, was completed to 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 1961.

A total of 199,930 tons of ore was hoisted; 248,734 tons was milled, the mill averaged 995 tons daily.

The average number of employees, excluding the mill, was 56: 41 underground, and 15 on surface. C. F. Gloeckner was works manager; R. C. Nelson was mine superintendent.

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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, Que. The executive office is at 50 Maitland Street, Toronto. The mine address is Caledonia.

The company has two gypsum properties totalling 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 1961. The room-and-pillar method of mining is used; this consists of rooms or pockets, leads, and crosscuts, all about 21 feet wide by 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 1961 was 13,420 feet.

During the year a total of 165,980 tons of ore was hoisted; 136,714 tons was milled. The mill averaged 471 tons daily.

The average number of employees, excluding the mill, was 29: 26 underground, and 3 on surface. C. L. Dryden was general manager; G. R. Hunt was mine superintendent.

Western Gypsum Products Limited

Western Gypsum Products Limited was incorporated in August 1929, with an authorized capitalization of 1,500,000 preferred shares of \$1 par value and 100,000 shares of no par value; 779,566.5 of the preferred shares and 49,685 shares of no par value have been issued. The directors and officers were: G. S. Thorvaldson, chairman and director; D. V. Damerell, president and director; N. W. Puttock, executive vice-president and director; R. C. Blair, vice-president, production manager, and director; G. H. Horner, vice-president, secretary-treasurer, and director; H. N. Butler, R. S. Jukes, and T. O. Peterson, directors. The head office is at 306 Electric Railway Chambers, 213 Notre Dame Avenue, Winnipeg 2, Manitoba. The mine address is Drumbo.

The company's property, the Oxford mine, consists of 600 acres located in Blenheim township, Oxford county. A diamond-drilling program, carried out in 1961, outlined a gypsum deposit in the area west of Drumbo. A recently developed longhole drilling method was used to penetrate the zones of water-bearing sands in the overburden and the rock strata to a depth of about 400 feet in lot 21, concession 6, Blenheim township. Plans were made that would permit the removal of a bulk sample from the gypsum bed.

The contractor employed an average of 4 men; W. J. McGill was engineer in charge at the property.

MICA

The quantity of mica produced was only about half the 1960 production, but the value was more than double, the 1960 material being largely scrap for grinding. In 1961, 10,700 pounds of trimmed mica and 22,306 pounds of splittings were produced. The operations were all carried out by individuals, and there are no available figures for employment and supplies used.

MINERAL WATER

One operator, Brevages Excel Limitée, in Russell county, processed 6,985 gallons valued at \$2,786. There are no available figures for employment or supplies used.

NATURAL GAS AND PETROLEUM

Production of natural gas decreased 14.38 percent in volume and 14.60 percent in value from the 1960 production.

Production of petroleum increased 14.34 percent in quantity and 12.59 percent in value over the production of 1960.

Full details regarding these industries are given in the 1961 report of the Ontario Department of Energy Resources.

NEPHELINE SYENITE

The quantity produced was only about 300 tons or 0.13 percent less than in 1960, but the value of the product decreased 11.04 percent. General statistics for the industry are given under ASBESTOS.

Industrial Minerals of Canada Limited

American Nepheline Limited was incorporated in January 1945, with an authorized capitalization of 4,500,000 shares of 50 cents par value. In 1961 the name was changed to Industrial Minerals of Canada Limited; the authorized capitalization was reduced to 1,000,000 shares of no par value, of which 410,000 shares have been issued. The directors and officers were: W. H. Woods, president and director; J. J. Mather, executive vice-president and director; J. T. McWhirter, treasurer and director; F. D. Hart and M. F. Goudge, directors; D. D. Anderson secretary. The head office is at 25 King Street West, Toronto. The mine address is Nephon via Lakefield.

The property, consisting of about 2,424 acres, is in concession IX, Methuen township, Peterborough county.

Operations continued throughout 1961 in the open pit on the Cabin Ridge section of the property. Some 22 diamond-drillholes, totalling 4,420 feet, were completed from surface. New equipment added consisted of a rock drill (Tractair, Joy Manufacturing Co. Ltd., Galt).

A total of 175,811 tons of ore was mined, of which 175,634 tons was milled. The mill averaged 751 tons daily.

The average number of employees was 75: 64 in the plant, and 11 in the pit. E. B. Wright was resident manager.

International Minerals and Chemical Corporation (Canada) Limited (Industrial Minerals Division)

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,

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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; R. A. Lenon, treasurer, controller, and director; N. C. White and Louis Ware, directors; C. M. Edwards, secretary; B. R. Carlson, assistant controller; C. E. Gable and J. W. York, assistant secretaries; W. H. Wood, general manager. The head office is at 4 King St. West, Toronto 1. 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 1961. Some 1,000 feet of surface trenching, averaging 3 feet in depth, was completed. New construction consisted of a bag-storage building (30 x 50 ft., sheet-steel construction).

New equipment installed included: a 5-ton electric hoist for waste disposal, a rolls crusher (3 x 6 ft.); a double-deck screen, storage bins, bucket elevator, duct work and fan for dust removal, a set of forming rolls, and a resuscitator.

The open-pit operation produced 152,657 tons of ore. The mill treated 102,206 tons, averaging 335 tons daily.

The average number of employees was 51: 42 in the plant, and 9 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 30 November and operated their plant from 2 January to 12 December. The product was used chiefly for horticultural purposes. General statistics are included in those given under ASBESTOS.

PETROLEUM—see NATURAL GAS AND PETROLEUM

QUARTZ

International Nickel Company of Canada Limited and Falconbridge Nickel Mines Limited produced, from their own pits and quarries, 1,521,135 tons of quartz and fluxing sand for use in their smelter operations. The industry paid \$57,345 to 8 salaried employees and \$192,376 to 42 wage-earners, and used fuel and electricity worth \$43,556 and process supplies worth \$49,187.

SALT

The quantity of salt produced decreased 4.85 percent and the value decreased 2.92 percent from the 1960 production. Brine operations were carried out throughout the year in Essex county by Brunner Mond Canada Limited, Canadian Brine Limited, and Canadian Salt Company Limited; at Sarnia by Dow Chemical of Canada Limited and Sifto Salt (1960) Limited; and at Goderich by Sifto Salt (1960) Limited. The industry paid \$608,580 to 108 salaried employees and \$1,998,709 to 427 wage-earners. Fuel and electricity used cost \$723,008, and process supplies cost \$973,957.

Canadian Rock Salt Company Limited

Canadian Rock Salt Company Limited was incorporated in September 1952, with an authorized capitalization of 50,000 shares of no par value, of which 5,162 shares have been issued. The directors and officers were: Daniel Peterkin Jr., president and director; N. C. Hobson, executive vice-president and director; J. H. Burtch and W. D. Mahaffy, vice-presidents and directors; F. B. Common Jr. and H. R. Milner, 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 1, Sandwich West township, Essex county, on the shore of the Detroit River.

Operations continued throughout 1961.

SHAFTS, CANADIAN ROCK SALT MINE

| | Inclination | Number of Compartments | Total Depth |
|------------------|-------------|------------------------|---------------|
| No. 1 shaft..... | Vertical | 4 | feet 1,082 |
| No. 2 shaft..... | Vertical | 3 | 1,025 |

Production remained at a fairly high level throughout the year, with seasonal peaks in the first and last quarter, as may be expected in an industry with a history of demand fluctuations. The mildness of the previous winter was reflected in the inventory carryover of ice-control salt at the various depots. The Ojibway mine, which produces rock salt for both the domestic and export markets, continued its program of expanding auxiliary production equipment. This includes fines-removal facilities in the underground part of the operations, and outside inventory recovery and weighing systems in the surface plant.

The screening and conveying system installed underground is geared to eliminate the hoisting of excess fines and make it available for use on the improvement of underground haulage roadways. The screens prepare 200 tons per hour and permit ready removal by truck, shuttle car, or related equipment to the various points for underground usage.

The portable facilities installed above ground make possible the placing of 50,000 tons of graded salt in holding areas, and the same equipment may be used for subsequent reclaiming to bulk-loading stations. Included in this arrangement has been track extensions, truck and track scale installations to handle the product at the rate of 400 tons per hour. This system provides for the handling of graded product from production, covered storage, and outside storage simultaneously and at a normal loading rate.

The compaction program, as an adjunct to the milling phases of operations, has been extended to include a surge and storage silo with reclaim conveyors. The compaction of the excess granular solids has eliminated, to a large extent, the problem of balancing the ratios of hoisted products. The new equipment is tied into the present rail and truck loading-stations and is intended to increase the range of saleable products and speed up the loading rates for the various carriers.

The underground development program of room-and-pillar advance with faces to a 20-foot height has been maintained. The recovery factor of 50 percent remains unchanged, and the practice of leaving 6 feet of salt on the roof for

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continuity of stress patterns has proven most successful. Underground transformer stations have been moved forward to keep abreast of present development work.

Development work in 1961 on the 975-foot level consisted of 6,750 feet of drifting, 2,500 feet of crosscutting, and 6,650 feet of rooms. Total development footage to 31 December 1961 was as follows: 37,700 feet of drifting; 24,200 feet of crosscutting; 64,725 feet of rooms.

A total of 746,508 tons of salt was hoisted and milled. The mill treated a daily average of 2,985 tons.

The average number of employees was 139: 75 underground, and 64 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 head office and mine offices are at Goderich.

Operations continued throughout 1961.

SHAFTS, SIFTO SALT (1960) LIMITED

| | Inclination | Number of Compartments | Sinking in 1961 | Total Depth |
|------------------|-------------|------------------------|-----------------|-----------------|
| No. 1 shaft..... | Vertical | 3 | feet | feet |
| No. 2 shaft..... | Vertical | — | 90.5 | 1,867.5 90.5 |

Late in 1961 a start was made on the sinking of No. 2 shaft. The shaft is circular in shape, 16 feet in diameter, and is to be concrete lined for the full depth. No separate compartments are being established during sinking, and at present it is not planned to install a conveyance in this shaft.

Mining is carried out by the room-and-pillar method on the 1,760-foot level. Original headings were excavated 18 feet high and 60 feet wide. Later a large drill jumbo was used to increase the excavation height to 45 feet. Pillars are 210 feet square, giving an extraction ratio of 40 percent.

Excavations started in 1960 were completed in 1961 for the relocation of the primary crusher and for the installation of complete underground crushing, screening, and stockpiling of finished grades of rock salt. The new mill was erected in an underground room, 225 feet long, 60 feet wide, and 45 feet high.

In August the primary crusher was moved to a position some 1,250 feet from the shaft, and the crushed salt was transported to the shaft by a series of four conveyors. In October a selective screening plant with secondary crushing was put into use. This plant produces four sizes of salt from the primary circuit and two sizes from the secondary circuit, at the same time rejecting rock waste and unsaleable fines. The waste material is now disposed of in worked-out areas of the mine, whereas the finished products are stockpiled and conveyed to the shaft as required. Provision was made for further stockpiling of salt in nearby rooms.

New equipment installed in the underground mill system to give a designed capacity of 450 tons per hour was as follows:

| Number | Description | Capacity | Manufacturer |
|--------|---|---------------|------------------|
| | | tons per hour | |
| 1 | Hammer mill, Model PWRB 4136 | 150 | Universal |
| 1 | Electromagnetic feeder, 5 x 10 ft. | 500 | Stephens-Adamson |
| 3 | Vibrating feeder, "Vibrex" | 450 | Hewitt-Robins |
| 4 | Conveyors, Limberoller 36 in. | 500 | Joy |
| 17 | Conveyors, 18 in., 24 in., and 30 in. | varies | Hewitt-Robins |
| 2 | Screens mech. vibr., 3-deck, 6 x 16 ft. | 215 | Hewitt-Robins |
| 2 | Screens mech. vibr., 3-deck, 6 x 12 ft. | 200 | Hewitt-Robins |
| 4 | Screens electromagnetic, 2-deck, 4 x 15 ft. | 60 | Tyler |
| 2 | Feeder electromagnetic, 2-deck, 3 x 6 ft. | 500 | Jeffrey |
| 1 | Magnetic separator, Model R.M.O. 130 | — | Dings |

The following mining equipment was taken underground and put into service during 1961:

- 1 rock wagon (Michigan, model 210, 25-ton capacity).
- 1 hydraulic crane (Austin Western) for high scaling.
- 1 farm tractor (Massey Ferguson) for service work.

Development footage in 1961 consisted of 4,918 feet of drifting. Total development footage to 31 December 1961 was as follows: 16,699 feet of drifts, 220 feet of which has been for ventilation; 108 feet of raises.

A total of 729,886 tons of salt was hoisted and milled. The average daily milling rate was 2,433 tons.

The average number of employees was 120: 65 underground, and 55 on surface. In addition, the shaft contractor (Cementation Company (Canada) Limited) employed an average of 9 men in the sinking of No. 2 shaft. W. G. Muir was mine manager.

SULPHUR

The value of sulphur produced in 1961 was 15.42 percent less than the 1960 value. Some elemental sulphur is recovered in Ontario, but the greater part of the Province's production reported represents the sulphur content of sulphuric acid and liquid sulphur dioxide obtained from smelter gases in the Sudbury area, and in a comparatively smaller measure from the refining of concentrates shipped from the Manitowadge area. The general statistics for the production of sulphur are included in those given under NICKEL AND COPPER.

TALC

Production in 1961 increased 3.17 percent in quantity and 4.88 percent in value over that of 1960. General statistics for the industry are included in those given under ASBESTOS.

Canada Talc Industries Limited

Canada Talc Industries Limited was incorporated in July 1951, with an authorized capitalization of 1,000,000 shares of no par value, of which 950,174 shares have been issued. The officers were: H. L. Roscoe, president, N. C.

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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 1961. Mining is through No. 2 shaft of the Conley mine and No. 3 shaft of the Henderson mine.

SHAFTS, CANADA TALC PROPERTIES

| | Location | Inclination | Number of Compartments | Total Depth from Surface |
|--|--------------------------------------|-------------|------------------------|--------------------------|
| | | | | feet |
| CONLEY MINE | | | | |
| No. 1 shaft (inactive) | Huntingdon twp. lot 15, con. XIV. | Vertical | 2 | 431 |
| 7th level winze (below 420 feet) (inactive) | lot 15, con. XIV. | Vertical | 2 | 451 |
| Escapement raise (inactive) | lot 15, con. XIV. | Vertical | 1 | 185 |
| No. 2 shaft | lot 15, con. XIV. | Vertical | 3 | 420 |
| HENDERSON MINE | | | | |
| No. 3 shaft | Huntingdon twp. lot 14, con. XIV. | Vertical | 2 | 456 |

Development work in 1961 consisted of 393 feet of drifting and 10 feet of crosscutting. Total development footage to 31 December 1961 was as follows: 14,072 feet of drifts; 4,127 feet of crosscuts; 3,768 feet of raises. Some 10 diamond-drillholes, totalling 1,192 feet, were completed from underground.

The following equipment was installed in the mill in 1961:

- 1 circular screen (SWECO, 48-in. diam., capacity 4 tons per hour).
- 1 bucket elevator (Link Belt, 40-ft., capacity 10 tons per hour).
- 1 vibrating screen (Dillon triple-deck, 3 x 8 ft., capacity 10 tons per hour).
- 1 bucket elevator (Link Belt, 20 ft., capacity 10 tons per hour).

A total of 11,691 tons of ore was hoisted; 605 tons was sold as crude talc; 9,785 tons was milled at an average of 50 tons daily.

The average number of employees was 18: 10 underground, and 8 on surface. H. E. Roscoe was manager.

Structural Materials

CEMENT

Production of cement increased 10.96 percent in quantity and 16.20 percent in value over that of 1960.

Canada Cement Company Limited operated quarry and plant at Woodstock throughout the year; quarry and plant at Belleville from 1 January to 16 November; the quarry at Port Colborne from 28 March to 13 October; and the plant at Port Colborne from 6 April to 10 October.

Quarries and plants were operated throughout the year by Lake Ontario Portland Cement Company Limited at Picton, and by St. Mary's Cement Company Limited at St. Mary's. St. Lawrence Cement Company operated the plant at Clarkson throughout the year, and the quarry from 15 March to 1 December.

The industry employed 180 salaried persons and paid them \$1,188,662, and 836 wage-earners who were paid \$4,309,782. Fuel and electricity used cost \$5,981,234, and process supplies used cost \$1,676,003.

CLAY PRODUCTS

The value of clay products decreased 2.07 percent from the value of the 1960 production. There were 46 operators with 50 plants. They employed 186 salaried employees and paid them \$998,350, and 1,583 wage-earners and paid them \$5,850,387. Fuel and electricity used cost \$3,073,600, and process supplies used cost \$530,500.

CLAY PRODUCTS MARKETED, 1961

| Kind | Quantity | Value |
|--|-----------|--------------|
| Brick: | | |
| Soft-mud process {face..... M | 7,420 | \$ 466,487 |
| {common..... M | 1,026 | 28,637 |
| Stiff-mud (wire-cut) process {face..... M | 169,707 | 9,673,486 |
| {common..... M | 31,750 | 960,655 |
| Dry-press {face..... M | 22,604 | 1,240,365 |
| {common..... M | 1,300 | 26,830 |
| Fancy or ornamental brick (including special shapes, embossed and enamelled brick)..... M | 475 | 70,328 |
| Sewer..... M | 996 | 42,100 |
| Paving brick..... M | 493 | 48,530 |
| Tile: | | |
| Structural (hollow blocks, including fireproofing and load-bearing tile)..... tons | 51,230 | 1,650,542 |
| Floor tile..... sq. ft. | 177,640 | 84,350 |
| Drain..... M | 48,479 | 2,686,550 |
| Sewer pipe..... feet | 2,506,300 | 1,200,400 |
| Pottery from domestic clay..... | | 516,430 |
| Flue linings..... feet | 732,832 | 557,366 |
| Other products..... | | 521,232 |
| Total..... | ———— | \$19,774,288 |

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LIME

Production of quicklime decreased 14.11 percent in quantity and 6.54 percent in value from 1960. The quantities of hydrated lime produced differed only by a few pounds, but the 1961 value of the product decreased 2.97 percent. There were eleven producers, operating 14 plants, with 50 kilns in use. The industry paid \$270,690 to 56 salaried employees, and \$1,617,019 to 356 wage-earners. Fuel and electricity used cost \$1,876,889, and process supplies used cost \$243,290.

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.
 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.
 Rockwood Lime Company Limited, Rockwood.

Canada and Dominion Sugar operated for 83 days at the Chatham kiln, and Cobo Minerals Limited operated at Coboconk for 50 days.

LIME, 1961

| Industrial Consumption | Quicklime | | Hydrated Lime | |
|--|-----------|------------|---------------|-------------|
| | Quantity | Value | Quantity | Value |
| | tons | | tons | |
| Building trades, finishing, and masonry..... | 15,532 | \$ 251,211 | 65,580 | \$1,416,176 |
| Agriculture..... | 64 | 750 | 1,039 | 14,800 |
| Industry: | | | | |
| Smelters..... | 13,654 | 158,415 | 3,020 | 44,872 |
| Iron and steel..... | 161,451 | 1,838,595 | 1,178 | 17,560 |
| Gold-milling..... | 6,477 | 79,427 | 1,277 | 18,947 |
| Uranium milling..... | 117,612 | 1,491,661 | 138 | 1,915 |
| Pulp and paper..... | 22,023 | 241,404 | 1,656 | 23,228 |
| Glass..... | 18,365 | 246,912 | | |
| Sugar..... | 6,639 | 47,600 | 540 | 4,347 |
| Tanneries..... | 764 | 8,938 | 3,751 | 53,315 |
| Fertilizers and insecticides..... | 997 | 11,492 | 747 | 13,320 |
| Chemical industries..... | 396,340 | 5,184,348 | 25,052 | 361,583 |
| Other consumers..... | 867 | 11,976 | 367 | 5,340 |
| Total..... | 760,785 | 9,572,729 | 104,345 | \$1,975,403 |

SAND AND GRAVEL

The quantity of sand and gravel produced decreased 3.32 percent, and the value decreased 1.66 percent from the 1960 production. There were 350 reporting pit operators and 7 reporting dredge operators. The industry employed 257

salaried personnel and paid them \$1,230,687, and 1,738 wage-earners and paid them \$6,492,300. Fuel and electricity used cost \$2,013,670, and process supplies cost \$421,000.

OUTPUT OF SAND AND GRAVEL

| Source | 1957 | 1958 | 1959 | 1960 | 1961 |
|---|------------|------------|------------|------------|------------|
| Private pit operators..... tons | 32,134,104 | 31,853,372 | 34,559,281 | 34,670,825 | 35,156,479 |
| \$ | 21,100,962 | 23,514,262 | 24,520,143 | 24,254,713 | 26,516,817 |
| Dredged from the Great Lakes and rivers..... tons | 1,862,920 | 1,263,381 | 1,306,943 | 1,163,678 | 1,035,600 |
| \$ | 1,742,507 | 1,421,628 | 1,616,294 | 1,490,251 | 1,405,300 |
| Ontario Department of Highways..... tons | 19,537,000 | 21,077,081 | 24,776,179 | 26,303,751 | 24,395,141 |
| \$ | 7,808,000 | 8,460,000 | 7,226,546 | 10,521,500 | 8,065,144 |
| Counties and townships... tons | 10,455,849 | 11,816,303 | 11,919,781 | 14,281,959 | 13,356,500 |
| \$ | 5,227,925 | 5,908,152 | 5,959,891 | 7,140,980 | 6,678,250 |
| Railway ballast..... tons | 2,139,285 | 1,458,927 | 1,419,519 | 1,240,620 | 1,140,600 |
| \$ | 820,501 | 750,989 | 372,728 | 522,264 | 535,700 |
| Total..... tons | 66,129,158 | 67,469,064 | 73,981,703 | 77,660,833 | 75,084,320 |
| \$ | 36,699,895 | 40,055,031 | 39,695,602 | 43,929,708 | 43,201,211 |

STONE

Production of stone decreased 1.82 percent in quantity and 0.84 percent in value from that of 1960. There were 78 operators working in about 87 quarries. The industry paid \$1,036,250 to 231 salaried employees, and \$4,807,360 to 1,237 wage-earners. Fuel and electricity used cost \$1,352,320, and process supplies used cost \$2,231,784.

There were 2,715,620 tons of limestone quarried for the manufacture of cement, and 1,590,600 tons for the manufacture of lime. The ultimate products only, in both cases, are reported so that there is no duplication of the mineral material in the statistics of the industry.

OUTPUT OF STONE

| Variety | 1957 | 1958 | 1959 | 1960 | 1961 |
|----------------------------|------------|------------|------------|------------|------------|
| Limestone..... tons | 16,592,404 | 15,144,361 | 16,322,071 | 16,118,571 | 15,907,044 |
| \$ | 19,748,013 | 18,542,922 | 19,363,443 | 18,782,082 | 18,793,178 |
| Marble..... tons | 40,328 | 33,989 | 51,440 | 40,423 | 33,929 |
| \$ | 298,496 | 301,135 | 327,644 | 356,762 | 309,623 |
| Trap and granite..... tons | 719,026 | 550,362 | 882,236 | 1,695,446 | 1,647,655 |
| \$ | 1,605,542 | 1,265,996 | 1,811,344 | 3,631,262 | 3,515,600 |
| Sandstone..... tons | 38,680 | 27,848 | 33,049 | 84,143 | 24,176 |
| \$ | 543,764 | 560,427 | 550,994 | 450,553 | 408,683 |
| Total..... tons | 17,390,438 | 15,756,560 | 17,288,796 | 17,938,583 | 17,612,804 |
| \$ | 22,195,815 | 20,670,480 | 22,053,425 | 23,220,659 | 23,027,084 |

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