# THE CLEVELAND-CLIFFS IRON COMPANY
## MINING DEPARTMENT
## ANNUAL REPORT OF GENERAL MANAGER
## FOR YEAR ENDING DECEMBER 31st, 1937

#2002

1933/152

THE CLEVELAND-CLIFFS IRON COMPANY

ORE MINING DEPARTMENT

MANAGER'S ANNUAL REPORT
YEAR 1931

I N D E X



Continued,-

THE CLEVELAND-CLIFFS IRON COMPANY

ORE MINING DEPARTMENT

MANAGER'S ANNUAL REPORT
YEAR 1931

I N D E X

Sheet #2



Continued,-

THE CLEVELAND-CLIFFS IRON COMPANY

ORE MINING DEPARTMENT

MANAGER'S ANNUAL REPORT
YEAR 1931

I N D E X

Sheet #3



HCS:ECC
2-24-32

THE CLEVELAND-CLIFFS IRON COMPANY
ORE MINING DEPARTMENT

MANAGER'S ANNUAL REPORT
CROSS INDEX BY MINES

YEAR 1931

THE CLEVELAND-CLIFFS IRON COMPANY
ORE MINING DEPARTMENT

MANAGER'S ANNUAL REPORT
CROSS INDEX BY MINES
YEAR 1931

Sheet #2

THE CLEVELAND-CLIFFS IRON COMPANY
ORE MINING DEPARTMENT
MANAGER'S ANNUAL REPORT
CROSS INDEX BY MINES
YEAR 1931

Sheet #3

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HCS:ECC
2-24-32

Ishpeming, Michigan
February, 16th, 1932

Mr. Wm. G. Mather, President
1460 Union Trust Bld.
Cleveland, Ohio

Dear Sir:-

I beg to submit the report of the operations of the Mining Department for the year 1931.

The inventories, maps and statements relative to the 1931 report have gone forward to you under separate cover.

The colored portions of the maps show the work for the year. The reports of the different mines of the Company were made by the Superintendents in charge and the Reports of the Engineering, Mechanical, Electrical, Geological, Safety and Welfare Departments by the heads of these Departments.

During the year a depression has been upon us and work has been continued on a greatly reduced basis. Everyone realized the seriousness of the situation and has co-operated to the fullest extent in order to put into effect every possible economy.

The accident record for 1931 shows progress made in the promotion of safety and the elimination of accidental injury to employees. Severity and frequency rates are being lowered with each passing year. There was a total of 27 accidents in 1931 compared with 83 in 1930. The surface work at all the underground mines did not sustain a single lost-time accident. We had three underground fatalities, which is the third lowest in the history of the Company since 1898. The severity rate for the year was 10 percent lower than the 1930 rate and 30 percent lower than the rate for 1929.

Many unusually good accident records have been made during the past four years by individual mines and plants. Most of them have already to their credit a perfect record for one year and a number have passed or are approaching a two year perfect period. We have already been honored with the award of three certificates of merit from the Joseph A. Holmes Safety Association in recognition of records established prior to 1931 and our accident record for the past two years has been cited frequently by the U. S. Bureau of Mines as the most outstanding safety record in the entire mining industry of the country.

On December 27th, a safety program was broadcast from the 8th Level of the Cliffs Shaft Mine. The safety message was addressed especially to the wives and children of our employees. It was well received and we have every reason to believe good will result from it.

Each of the Superintendents report the time when the operating schedules at our various mines were changed. They also report the reduction in wages. It is therefore unnecessary for me to repeat this.

The only outstanding lease is the Empire Iron Company covering the SW¼ of Section 19,47-26. This property has been sub-let to the C. K. Quinn Company. It was idle during 1931.

Respectfully submitted

Manager

SRE:DP

COMBINED COMPARISON OF ATHENS, MAAS, NEGAUNEE AND MORRIS LLOYD MINES
1931 and 1930

| | AVERAGE SHIFT BOSSES RATE | | | | AVERAGE CONT. MINERS RATE | | | | TONS OF ORE PER MAN PER DAY STOPING AND DEVELOPMENT | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1931 | 1930 | Inc.Dec. | % | 1931 | 1930 | Inc.Dec. | % | 1931 | 1930 | Inc.Dec. | % |
| Athens ..... | $5.58 | 5.62 | .04 | .7 | $5.68 | 5.87 | .21 | 3.6 | 21.38 | 21.44 | .04 | .2 |
| Maas ..... | 5.57 | 5.80 | .23 | 4.0 | 5.60 | 5.95 | .35 | 5.9 | 18.91 | 18.79 | .12 | .64 |
| Negaunee ..... | 5.59 | 5.73 | .14 | 2.4 | 5.67 | 5.81 | .14 | 2.4 | 21.24 | 21.69 | .45 | 2.1 |
| Morris Lloyd ..... | 5.66 | 5.99 | .33 | 5.5 | 5.68 | 5.99 | .31 | 5.2 | 21.10 | 22.03 | .93 | 4.2 |
| AVERAGE ..... | 5.60 | 5.79 | .19 | 3.3 | 5.66 | 5.89 | .23 | 3.9 | 20.61 | 20.99 | .38 | 1.8 |

(Actual weighted figures)

| | Cost per Ton for Labor Stoping and Development | | | |
|---|---|---|---|---|
| | 1931 | 1930 | Inc.or Dec. | % |
| Athens ..... | $.269 | .273 | .004 | .2 |
| Maas ..... | .299 | .317 | .018 | 5.6 |
| Negaunee ..... | .268 | .269 | .001 | .4 |
| Morris Lloyd.. | .269 | .271 | .002 | .7 |
| Average..... | .276 | .281 | .005 | .2 |

(Actual Weighted figures)

Note:

Average Shift Bosses Rate does not include Safety Bonus.

10% decrease in wages effective all above mines Oct.1st 1931

Operations were reduced at all the above mines during 1931, and since Nov.15 they are all operating on a 2 day per week schedule; in 1930 the mines operated on full time to July 1 and from then on 5 days per week.

## COMPARISON OF TOTAL DAYS WORKED AND TONS OF ORE MINED FOR YEARS 1931 and 1930

| | 1931 Days | 1930 Days | 1931 Days | 1930 Days |
|---|---|---|---|---|
| Stephenson (production) | 442½ | 696¾ | | |
| Princeton | 367 | 444½ | | |
| Miscellaneous Payroll | 3,938¾ | 7,152¾ | | |
| Shops and Storehouse | 7,660¾ | 13,102¼ | | |
| Opening & Equipping Tilden | - | 1,756¼ | | |
| Francis | 12¼ | 321½ | | |
| Megaunee Miscellaneous & General | 3,448¾ | 5,095 | | |
| Athens " " | 846½ | 1,420½ | | |
| C.C.I.Co. " " | 27,885¼ | 37,283¾ | | |
| Cliffs Power & Light Co. | 12,970 | 17,964¼ | | |
| Mesaba Cliffs Iron Mining Co. | 2,920¾ | 19,984¾ | | |
| Republic | 26 | 324½ | | |
| Reopening Wade | - | 1,554½ | | |
| Holman Cliffs Misc. & General | 4,239¾ | 14,087½ | | |
| Canisteo Cliffs " " | 32,955¾ | 35,436 | | |
| Wade & Alexandria " " | 2,508¾ | 5,316 | | |
| General Roll - Undistributed | 31,483 | 31,859½ | | |
| Sherwood | 984 | | | |
| TOTAL | 132,689¾ | 193,800 | | |
| Grand Total - All Operations | 495,434 | 767,945¼ | | |
| Net for Operating Mines | 362,744¼ | 574,145¼ | 362,744¼ | 574,145¼ |
| Total Tons | 2,537,021 | 4,568,040 | | |
| Tons per Man per Day | 6.99 | 7.96 | | |
| Decrease | .97 - 12.2% | | | |
| OPEN PIT PRODUCTION - TONS | | | | |
| Tilden | 137,010 | 287,043 | 4,488¼ | 5,336 |
| Hill Trumbull | 202,479 | 402,598 | 17,994¾ | 18,139 |
| Bingham North Star | 56,416 | 119,349 | 4,044 | 5,835¼ |
| Holman-Brown | 239,998 | 553,699 | 16,530 | 25,917½ |
| TOTAL | 635,903 | 1,362,689 | 43,057 | 55,227¾ |
| Open Pit Tons Per Man per Day | 14.77 | 24.67 | | |
| Net U.G.Days | | | 319,687¼ | 518,917½ |
| Net U.G.Production | 1,901,118 | 3,205,251 | | |
| U.G.Tons per Man Per Day | 5.95 | 6.177 | | |
| Decrease | .227 - 3.7% | | | |
| % Open Pit Production to Total Production | 25.06 | 29.83 | | |
| Decrease | | 4.77 | | |

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STATEMENT SHOWING COMPARATIVE COST FOR ALL EXPLOSIVES USED AT HARD ORE MINES

| | 1928 | 1929 | 1930 | 1931 |
|---|---|---|---|---|
| PRODUCT ..... | 413,994 | 421,314 | 407,925 | 291,057 |
| Powder | | | | |
| Pounds - Gelamite "A"..... | | | | 19,150 |
| Gelamite 2 X ..... | | | | 19,250 |
| 50% L.F. ..... | 141,390 | 262,100 | 231,600 | 130,646 |
| 60% L.F. ..... | 49,400 | 140,900 | 228,350 | 129,150 |
| 60% Gelatine..... | | | | 12,700 |
| #2-3-4- Special... | 133,900 | 14,700 | | |
| E.P. 23 ..... | 21,350 | 4,250 | | |
| Total Pounds ..... | 346,040 | 421,950 | 459,950 | 310,896 |
| Total Cost ..... | $47,860.12 | $55,207.66 | $59,952.66 | $39,783.27 |
| Fuse - Feet ..... | 511,350 | 593,500 | 645,990 | 432,368 |
| Caps - Number ..... | 116,445 | 125,900 | 130,000 | 79,470 |
| Cap Crimpers..... | 24 | 10 | 1 | 6 |
| Connecting Wire..... | | | | 9 |
| Delay Fuses..... | | | | 225 |
| Fuse Lighters ..... | | | | 4,450 |
| Fuse Containers..... | | 100 | | 2 |
| Tamping Bags..... | | | | 29,900 |
| Blasting Machine..... | | | | 1 |
| Total Cost Fuse, caps.etc | $ 4,243.42 | $ 5,043.55 | $ 5,181.52 | $ 3,563.05 |
| Total Cost all Explosives | $52,103.54 | $60,251.21 | $65,134.18 | $43,346.32 |
| Average Price per Lb.-Powder | .1383 | .1308 | .1303 | .1279 |
| Cost per Ton - Powder ..... | .1156 | .1310 | .1469 | .1367 |
| Cost per Ton - Fuse, etc... | .0102 | .0120 | .0128 | .0122 |
| Cost Per Ton All Explosives | .1258 | .1430 | .1597 | .1489 |
| Pounds Powder per Ton of Ore | .8358 | 1.0015 | 1.1275 | 1.0681 |

Open Pit mines not included.
Cost per ton all explosives decreased $.0108 or 6.8%.

The production in 1931 decreased 116,868 tons or 28.6% in comparison with 1930. This was due to curtailment of working schedule. The total cost for all explosives decreased $21,787.86 or 33.5%.

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## STATEMENT SHOWING COMPARATIVE COST OF ALL EXPLOSIVES USED AT SOFT ORE MINES

| | 1928 | 1929 | 1930 | 1931 |
|---|---|---|---|---|
| PRODUCT ..... | 1,756,236 | 2,149,826 | 2,797,426 | 1,609,267 |
| Powder | | | | |
| Pounds - 35% ..... | | | 35,000 | |
| 40% ..... | 158,650 | 137,066 | 362,247 | 50,286 |
| 50% ..... | 318,950 | 449,850 | 329,060 | 301,840 |
| 55% ..... | | 21,382 | 4,350 | |
| 60% ..... | 338,725 | 469,981 | 462,083 | 247,870 |
| IX and 2X Gelamite. | | | 249,392 | 234,311 |
| Gelamite A ..... | | | | 8,900 |
| #2-3-4- Special ... | 55,600 | | | |
| Total Pounds ..... | 871,925 | 1,078,279 | 1,442,132 | 843,207 |
| Total Cost ..... | $123,312.40 | $144,456.48 | $185,009.94 | $106,464.82 |
| Fuse - Feet ..... | 2,529,868 | 3,086,716 | 4,386,169 | 2,475,567 |
| Caps - Number ..... | 425,009 | 534,829 | 707,928 | 396,091 |
| Fuse Cutter ..... | 173 | 31 | 1 | 2 |
| Connecting Wire - pounds ... | | 18 | 62 | |
| Tamping Bags ..... | 118,930 | 93,400 | 58,300 | 141,800 |
| Sealing Compound - Pints ... | | 9 | 21 | 10 |
| Powder Bags ..... | | 93 | 121 | 61 |
| Fuse and Cap Containers..... | | 81 | 7 | 2 |
| Fuse Lighters ..... | | | | 19,000 |
| Delay Fuses ..... ..... | | | | 500 |
| Total Cost, Fuse, etc..... | $ 20,090.82 | $ 25,205.15 | $ 31,976.93 | $ 19,742.29 |
| Total Cost All Explosives | $ 143,403.22 | $169,661.63 | $216,986.87 | $126,207.11 |
| Average Price per Lb. - Powder | .1414 | .1339 | .1283 | .1263 |
| Cost per Ton - Powder ..... | .0702 | .0672 | .0661 | .0662 |
| Cost per Ton - Fuse, etc.... | .0114 | .0117 | .0114 | .0122 |
| Cost per Ton all Explosives | .0816 | .0789 | .0775 | .0784 |
| Pounds of Powder per Ton of Ore | .4964 | .5015 | .5155 | .5240 |

Notes:

The Wade Mine suspended operations May 1st,1931 and the Alexandria August 17th.
The product in 1931 decreased 1,188,159 tons or 42.5% in comparison with 1930, this being due to curtailment of working schedules.
The total cost for all explosives decreased $90,779.76 or 41.8%.

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## STATEMENT SHOWING COMPARATIVE COST FOR ALL MINE TIMBER USED AT SOFT ORE MINES

| | 1928 | 1929 | 1930 | 1931 |
|---|---|---|---|---|
| Product..... | 1,756,236 | 2,149,826 | 2,797,426 | 1,609,267 |
| **Timber** | | | | |
| Feet - 6 to 8 ..... | 515,639 | 607,310 | 545,779 | 362,294 |
| 8 to 10 ..... | 319,807 | 448,870 | 535,590 | 210,599 |
| 10 to 12 ..... | 193,780 | 244,916 | 246,070 | 227,377 |
| 12 to 14 ..... | 93,890 | 97,467 | 93,586 | 110,468 |
| 14 to 16 ..... | 108 | 1,443 | 4,177 | 14,110 |
| 7 to 9 ..... | 14,291 | | 437,735 | 138,996 |
| 9 to 12 ..... | | | 123,801 | 29,241 |
| Treated Timber ..... | | | 7,892 | 1,760 |
| Total Feet ..... | 1,137,515 | 1,400,006 | 1,994,630 | 1,094,845 |
| Total Cost ..... | $75,578.00 | $93,115.35 | $142,297.16 | $83,193.29 |
| **Lagging** | | | | |
| Feet - 5' ..... | 1,202,025 | 1,388,900 | 1,405,900 | 340,638 |
| 6' ..... | 95,000 | | 1,177,382 | 747,670 |
| 7' ..... | 3,220,789 | 3,969,698 | 4,193,004 | 2,870,862 |
| 8' ..... | 598,784 | 644,744 | 505,618 | |
| Total Feet ..... | 5,116,598 | 6,003,342 | 7,281,904 | 3,959,170 |
| Total Cost ..... | $37,679.62 | $44,669.80 | $54,263.34 | $28,398.21 |
| Covering Boards - Feet ..... | 163,397 | 105,247 | 993,129 | 354,187 |
| Total Cost ..... | $ 3,230.13 | $1,998.12 | $12,437.37 | $4,451.44 |
| Poles - Feet ..... | 2,053,550 | 2,734,607 | 4,219,572 | 2,581,462 |
| Total Cost ..... | $31,760.23 | $41,178.44 | $58,843.98 | $35,612.05 |
| Wire Fencing - Rods ..... | | | 6,875 | 5,716 |
| Total Cost..... | | | $ 5,179.00 | $ 4,567.06 |
| Total Cost for All Timber ..... | $148,247.98 | $181,001.71 | $273,020.85 | $156,222.05 |
| Average cost per foot - Timber.... | .0642 | .0665 | .0713 | .0760 |
| " " " 100 Ft.-Lagging... | .7361 | .744 | .745 | .717 |
| " " " 100 Ft.-Cover Bds. | 1.977 | 1.898 | 1.252 | 1.256 |
| " " " 100 Ft.-Poles..... | 1.547 | 1.510 | 1.394 | 1.379 |
| " " " Rod - Wire Fencing | | | .753 | .799 |
| Feet of timber per ton of ore..... | .6478 | .6512 | .7130 | .6803 |
| Feet of Lagging per ton of ore.... | 2.913 | 2.792 | 2.603 | 2.460 |
| Feet of Poles per ton of ore..... | 1.169 | 1.272 | 1.508 | 1.604 |
| Feet of Covering Bds.per ton of ore | .0093 | .0049 | .355 | .220 |
| Feet of wire fencing per ton of ore | | | .121 | .0586 |
| Cost per ton for Timber ..... | .0430 | .0433 | .0508 | .0516 |
| " " " for Lagging..... | .0214 | .0208 | .0194 | .0176 |
| " " " for Poles ..... | .0181 | .0192 | .0210 | .0221 |
| " " " for Covering Boards.. | .0018 | .0009 | .0044 | .0029 |
| " " " for wire fencing..... | . | . | .0058 | .0029 |
| Cost per ton for all..... | .0843 | .0842 | .0976 | .0971 |

Note:- The Wade mine suspended operations May 1st,1931 and the Alexandria Mine August 17th. The product in 1931 decreased 1,188,159 tons or 42.5% in comparison with 1930, this being due to curtailment of working schedules.
The total cost for all timber decreased $116,798.80 or 42.7%.

JSM:DP

## LABOR SUMMARY - ALL COMPANIES

| PRODUCT - TONS | 1928<br>2,775,542 | | 1929<br>3,534,754 | | 1930<br>4,568,040 | | 1931<br>2,537,021 | |
|---|---|---|---|---|---|---|---|---|
| | DAYS | AMOUNT | DAYS | AMOUNT | DAYS | AMOUNT | DAYS | AMOUNT |
| Surface | 207,047½ | 946,889.42 | 236,998¾ | 1,084,390.09 | 282,969½ | 1,330,588.07 | 184,235½ | 861,633.10 |
| Cost per Ton | | .3441 | | .3067 | | .2912 | | .3396 |
| Underground | 328,222¾ | 1,670,341.35 | 365,484 | 1,856,635.99 | 430,126 | 2,256,081.04 | 260,729½ | 1,329,358.41 |
| Cost per Ton | | .6017 | | .5254 | | .4939 | | .5240 |
| Supt. and General Roll | 49,295¾ | 391,671.46 | 48,880 | 377,465.05 | 54,850 | 424,159.51 | 50,469½ | 389,532.13 |
| Cost per Ton | | .1411 | | .1069 | | .0929 | | .1535 |
| Grand Total | 584,565¾ | 3,008,902.23 | 651,362¾ | 3,318,491.13 | 767,945½ | 4,010,828.62 | 495,434 | 2,580,523.64 |
| Cost per Ton | | 1.084 | | .939 | | .878 | | 1.0171 |
| Average Rate per Day | | 5.15 | | 5.09 | | 5.23 | | 5.21 |
| Tons per Man per Day | | 4.75 | | 5.43 | | 5.95 | | 5.12 |

Note:- The above is the total of all wages and salaries for all employees of the Mining Department, including Cliffs Power & Light Co.
Superintendent and General Roll Days and Amounts shown is all of the General Payroll except Mine Clerks and Captains which are included in Surface & Underground.
Previous years stockpile overruns not included in 1931 product.
10% decrease in wages effective October 1st, 1931

Working Schedule, 1931

Cliffs Shaft operated 6 days per week to April 1, 5 days to May 1st, 4 days to June 4th, 3 days to Nov. 16 and 2 days balance of year - staggered shifts.
Maas operated 5 days per week to May 1, 4 days to June 8, 3 days to Nov. 16 and 2 days balance of year, - staggered shifts.
Morris Lloyd operated 5 days per week to May 1, 4 days to June 8, 3 days to Nov. 16, and 2 days per week balance of year - staggered shifts.
Gardner Mackinaw operated 5 days per week to May 8, 4 days to June 1st, 3 days to Nov. 16th and 2 days balance of year - staggered shifts.
Spies Virgil operated two 8 hr. 6 days per week to May 25th, 1-8 hr. shift 5 days per week to Nov. 16, then 1 -8 hr. shift 2 days per week balance of year. Staggered shift.
Negaunee operated 4 days per week to Apr. 12, 3 days to Nov. 16, 2 days per week balance of year - staggered shift.
Athens operated 5 days per week to May, 1, 4 days to June 8, 3 days to Nov. 16, 2 days balance of year - staggered shift.

Wade operated 2-8 hr. shifts 4 days per week from Jan. 1 to May 1, when mine closed down.
Alexandria operated 1-8 hr. shift 4 days per week from Jan. 1, to August 17, when mine closed.
Hill Trumbull commenced operations June 1st and stopped Sept. 29th, 5 days per week to Aug. 17 and 4 days per week to Sept. 29.
Bingham-North Star, started operations July 22 and Closed Oct. 16, 5 days per week basis.
Holman-Brown started operations June 1st and closed Oct. 16, 6 days per week to June 27, and 5 days per week basis to Oct. 16.

JSM:DP

## STATEMENT SHOWING TOTAL COST OF SUPPLIES CHARGED TO "COST OF ORE AT MINE"

### SOFT ORE MINES

| YEAR | 1928 | | 1929 | | 1930 | | 1931 | |
|---|---|---|---|---|---|---|---|---|
| PRODUCT | 1,756,236 | | 2,149,826 | | 2,797,426 | | 1,609,267 | |
| CLASSIFICATION | AMOUNT | PER TON | AMOUNT | PER TON | AMOUNT | PER TON | AMOUNT | PER TON |
| General | 92,928.84 | .0529 | 107,893.25 | .0502 | 131,887.31 | .0471 | 81,863.81 | .0509 |
| Iron and Steel | 31,679.66 | .0180 | 38,877.35 | .0181 | 50,884.74 | .0182 | 25,795.75 | .0160 |
| Machinery | 117,816.27 | .0670 | 137,101.96 | .0638 | 154,614.44 | .0553 | 62,589.77 | .0389 |
| Explosives | 161,089.99 | .0917 | 177,543.73 | .0826 | 216,842.35 | .0775 | 126,553.63 | .0786 |
| Lumber and Timber | 182,139.31 | .1037 | 211,095.62 | .0982 | 312,235.17 | .1116 | 184,066.64 | .1144 |
| Fuel | 30,550.11 | .0174 | 30,389.23 | .0141 | 32,702.59 | .0117 | 20,568.90 | .0128 |
| Electric Power | 353,365.39 | .2068 | 434,631.89 | .2021 | 483,576.60 | .1729 | 336,176.50 | .2089 |
| Miscellaneous | 31,071.56 | .0177 | 33,943.70 | .0158 | 39,195.76 | .0140 | 64,271.17 | .0399 |
| TOTAL | 1,010,641.13 | .5750 | 1,171,476.73 | .5449 | 1,421,938.96 | .5083 | 901,886.17 | .5604 |

### HARD ORE MINES

| YEAR | 1928 | | 1929 | | 1930 | | 1931 | |
|---|---|---|---|---|---|---|---|---|
| PRODUCT | 413,994 | | 421,314 | | 407,925 | | 291,057 | |
| CLASSIFICATION | AMOUNT | PER TON | AMOUNT | PER TON | AMOUNT | PER TON | AMOUNT | PER TON |
| General | 41,435.40 | .1001 | 43,232.11 | .103 | 38,098.52 | .093 | 30,082.56 | .103 |
| Iron and Steel | 16,024.76 | .0387 | 20,364.82 | .048 | 18,242.85 | .045 | 12,219.13 | .042 |
| Machinery | 37,849.48 | .0914 | 55,344.08 | .132 | 41,954.95 | .103 | 23,716.20 | .081 |
| Explosives | 61,290.29 | .1480 | 60,275.62 | .143 | 65,134.18 | .160 | 43,346.32 | .149 |
| Lumber and Timber | 7,065.76 | .0171 | 7,052.74 | .017 | 12,367.87 | .030 | 7,803.59 | .027 |
| Fuel | 12,449.56 | .0301 | 5,422.23 | .013 | 4,320.58 | .011 | 3,463.12 | .012 |
| Electric Power | 80,072.05 | .1936 | 78,560.22 | .186 | 77,919.19 | .190 | 57,905.58 | .199 |
| Miscellaneous | 7,364.12 | .0178 | 5,575.37 | .013 | 5,186.43 | .013 | 7,962.62 | .027 |
| TOTAL | 263,551.42 | .6368 | 275,827.19 | .655 | 263,224.57 | .645 | 186,499.12 | .640 |

Soft Ore Mines

The Wade Mine suspended operations May 1st and the Alexandria August 17th.
The product decreased 1,188,159 tons or 42.5% in comparison with 1930, this due to curtailment of working schedules.
The total cost of supplies decreased $520,052.79 or 36.6%. The increase of $ .0521 per ton is due to decreased production, constant charges as electric power showing increase.
Open Pit mines not included.

JSM:DP

# CLIFFS SHAFT MINE

## ANNUAL REPORT

## YEAR 1931.

1. GENERAL:

Production for 1931 naturally shows a decrease compared with previous years because of curtailment. Shipments also were less than for any year in the past ten except 1921, when the total reached only 70,199 tons.

Because of the slowing up of ore shipments and the small demand for ore, we have in 1931 carried on an intensive development campaign underground, which resulted in opening up new ore reserves. During the past three years we have added 180,000 tons to our reserves.

2. PRODUCTION, SHIPMENTS & INVENTORIES:

a. Production by Grades:

| Grade | Product Tons |
|---|---|
| Cliffs Shaft Lump | 124,669 |
| Cliffs Shaft Crushed | 52,544 |
| Cliffs Shaft Run-of-Mine | 70,541 |
| Total Cliffs Shaft | 247,754 |
| | |
| Bancroft Lump | 29,048 |
| Bancroft Crushed | 12,569 |
| Bancroft Run-of-Mine | 1,686 |
| Total Bancroft | 43,303 |
| Grand Total Ore | 291,057 |
| Rock | 24,924 |
| Total Ore & Rock | 315,981 |

Production averaged 1448 tons per working day.

The proportion of lumps, fines and run-of-mine ore was as follows:-

| | | |
|---|---|---|
| Lump Ore | 153,717 Tons | 52.6% |
| Crushed Ore | 65,113 " | 22.5% |
| Run-of-Mine Ore | 72,227 " | 24.9% |
| Total | 291,057 " | 100.0% |

The production each year by grades since 1927 is as follows:-

| Year | Lump Ore Tons | Fine Ore Tons | Run-of-Mine Ore Tons | Total Tons |
|---|---|---|---|---|
| 1927 | 288,804 | 113,728 | | 402,532 |
| 1928 | 275,018 | 116,844 | | 391,862 |
| 1929 | 295,600 | 125,714 | | 421,314 |
| 1930 | 226,059 | 94,910 | 86,956 | 407,925 |
| 1931 | 153,717 | 65,113 | 72,227 | 291,057 |

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2. PRODUCTION, SHIPMENTS & INVENTORIES: (Continued)

b. Shipments:

Shipments for 1931 from pocket and stockpile totaled as follows:-

| Grade | Pocket Tons | Stockpile Tons | Total Tons | Total Last Year |
|---|---|---|---|---|
| Cliffs Shaft Lump | 5,565 | 12,434 | 17,999 | 126,231 |
| Cliffs Shaft Crushed | 6,333 | 5,766 | 12,099 | 30,460 |
| Cliffs Shaft Run-of-Mine | 70,541 | | 70,541 | 73,881 |
| Total Cliffs Shaft | 82,439 | 18,200 | 100,639 | 230,572 |
| Bancroft Lump | 586 | 9,624 | 10,210 | 27,178 |
| Bancroft Crushed | 285 | | 285 | 4,436 |
| Bancroft Run-of-Mine | 1,686 | | 1,686 | 13,075 |
| Total Bancroft | 2,557 | 9,624 | 12,181 | 44,689 |
| Grand Total | 84,996 | 27,824 | 112,820 | 275,261 |
| Total Last Year | 207,679 | 67,582 | 275,261 | |
| Decrease in Shipments | 122,683 | 39,758 | 162,441 | |

The table that follows shows the amount of ore shipped to the L.S. & I. Ry. and C. & N.W. Ry. Docks and the proportion that was routed all rail.

| | |
|---|---|
| L.S. & I. Dock | 100,334 Tons |
| C. & N.W. Dock | 8,182 " |
| All Rail | 4,304 " |
| Total | 112,820 " |

Shipments for the past five years follow:-

| | CLIFFS SHAFT | | | BANCROFT | | | |
|---|---|---|---|---|---|---|---|
| Year | Lump Tons | Crushed Tons | Run of Mine Tons | Lump Tons | Crushed Tons | Run of Mine Tons | Total Tons |
| 1927 | 240,781 | 98,848 | | 22,051 | 4,639 | | 366,319 |
| 1928 | 267,291 | 93,078 | | 20,049 | 8,315 | | 388,733 |
| 1929 | 305,278 | 133,433 | | 43,472 | 28,747 | | 510,930 |
| 1930 | 126,231 | 30,460 | 73,881 | 27,178 | 4,436 | 13,075 | 275,261 |
| 1931 | 17,999 | 12,099 | 70,541 | 10,210 | 285 | 1,686 | 112,820 |

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2. PRODUCTION, SHIPMENTS & INVENTORIES: (Continued)

c. Stockpile Inventories:

We finished the year with a large amount of ore in stock. The figures follow:-

| Grade | Tons |
|---|---|
| Cliffs Shaft Lump | 191,888 |
| Cliffs Shaft Crushed | 98,411 |
| Total Cliffs Shaft | 290,299 |
| Bancroft Lump | 27,799 |
| Bancroft Crushed | 24,762 |
| Total Bancroft | 52,561 |
| Grand Total Ore | 342,860 |

The amount of ore in stock for five years follows:-

| | | | |
|---|---|---|---|
| Ore on Hand - | Dec. 31st, 1927 | - | 73,507 Tons |
| Ore on Hand - | Dec. 31st, 1928 | - | 76,634 " |
| Ore on Hand - | Dec. 31st, 1929 | - | 31,959 " |
| Ore on Hand - | Dec. 31st, 1930 | - | 164,623 " |
| Ore on Hand - | Dec. 31st, 1931 | - | 342,860 " |

d. Division of Product by Levels:

| Level | "A" Shaft Tons | "B" Shaft Tons | Total Tons |
|---|---|---|---|
| First | 5,052 | 17,510 | 22,562 |
| Second | 17,343 | | 17,343 |
| Third | 9,431 | 4,037 | 13,468 |
| Fourth | 8,314 | | 8,314 |
| Fifth | 25,822 | 3,457 | 29,279 |
| Sixth | 23,072 | 8,275 | 31,347 |
| Seventh | 28,059 | 20,108 | 48,167 |
| Eighth | 11,142 | 7,627 | 18,769 |
| Ninth | 10,196 | | 10,196 |
| Tenth | 37,167 | 4,643 | 41,810 |
| Eleventh | 16,315 | 2,290 | 18,605 |
| Twelfth | 1,834 | 8,907 | 10,741 |
| Thirteenth | | 16,385 | 16,385 |
| Fourteenth | | 4,071 | 4,071 |
| Total Ore | 193,747 | 97,310 | 291,057 |
| Rock | | | 24,924 |
| Total Ore and Rock | | | 315,981 |

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2. PRODUCTION, SHIPMENTS & INVENTORIES: (Continued)

e. Production by Months:

| MONTH | JAN. | FEB. | MAR. | APR. | MAY | JUNE |
|---|---|---|---|---|---|---|
| Days | 26 | 24 | 26 | 22 | 16 | 15 |
| C.S. Lump | 19,696 | 18,129 | 20,227 | 16,113 | 8,559 | 2,510 |
| C.S. Crushed | 8,401 | 7,766 | 8,666 | 6,900 | 2,456 | 1,235 |
| C.S. Run-of-Mine | | | | 184 | 5,978 | 17,000 |
| Bancroft Lump | 2,500 | 2,661 | 4,111 | 3,568 | 1,913 | 1,762 |
| Bancroft Crushed | 1,106 | 1,151 | 1,746 | 1,529 | 657 | 755 |
| Bancroft Run-of-Mine | 292 | 146 | 270 | | 1,322 | 372 |
| Total Ore | 31,995 | 29,853 | 35,020 | 28,294 | 20,885 | 23,634 |
| Rock | 4,168 | 3,060 | 2,996 | 2,380 | 1,600 | 1,602 |
| Grand Total | 36,163 | 32,913 | 38,016 | 30,674 | 22,485 | 25,236 |

| MONTH | JULY | AUG. | SEPT. | OCT. | NOV. | DEC. |
|---|---|---|---|---|---|---|
| Days | 13 | 13 | 14 | 12 | 11 | 9 |
| C.S. Lump | 4,305 | 6,275 | 10,092 | 4,050 | 5,216 | 8,998 |
| C.S. Crushed | 1,845 | 2,686 | 4,644 | 1,856 | 2,233 | 3,856 |
| C.S. Run-of-Mine | 14,911 | 9,227 | 3,615 | 12,910 | 5,910 | 34 |
| Bancroft Lump | 2,153 | 1,766 | 2,476 | 2,576 | 1,980 | 2,081 |
| Bancroft Crushed | 922 | 754 | 1,106 | 1,104 | 848 | 891 |
| Bancroft Run-of-Mine | | | 56 | | | |
| Total Ore | 24,136 | 20,708 | 21,989 | 22,496 | 16,187 | 15,860 |
| Rock | 1,198 | 1,296 | 1,978 | 1,740 | 1,368 | 1,538 |
| Grand Total | 25,334 | 22,004 | 23,967 | 24,236 | 17,555 | 17,398 |

f. Ore Statement:

| | MINE RUN | | BANCROFT | | CLIFFS SHAFT | | | Total Last Year |
|---|---|---|---|---|---|---|---|---|
| | Cliffs Shaft | Bancroft | Lump | Crushed | Lump | Crushed | Total | |
| On Hand Jan. 1, 1931. | | | 8,961 | 12,478 | 85,218 | 57,966 | 164,623 | 31,959 |
| Output for Year | 69,769 | 2,458 | 29,638 | 12,569 | 124,079 | 52,544 | 291,057 | 407,925 |
| Transfers | 772 | 772 | 590 | | 590 | | | |
| Total | 70,541 | 1,686 | 38,009 | 25,047 | 209,887 | 110,510 | 455,680 | 439,884 |
| Shipments | 70,541 | 1,686 | 10,210 | 285 | 17,999 | 12,099 | 112,820 | 275,261 |
| Balance on Hand | | | 27,799 | 24,762 | 191,888 | 98,411 | 342,860 | 164,623 |

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2. PRODUCTION, SHIPMENTS & INVENTORIES: (Continued)

g. Delays:

| Date | Hours | Cause | Tons Lost |
|---|---|---|---|
| Jan. 21 | 2 | "A" shaft skip jammed in pocket. | 250 |
| Jan. 24 | ½ | "B" shaft hoist out of order. | 100 |
| Mar. 7 | 2½ | Coil on "B" shaft hoist burnt out. | 200 |
| May 4 | 1¾ | Top-tram motor switchboard out of order. | 300 |
| July 8 | 1 | "A" shaft lead broke on switchboard. | 100 |
| Sept. 21 | 2½ | Circuit breaker on crusher motor burnt out. | 250 |
| Oct. 26 | 1 | "B" shaft skip jammed in pocket. | 125 |
| Nov. 3 | 1 | Broken gate - 10th Level "A" shaft. | 100 |
| Nov. 18 | 2 | Main cable on 10th level burnt out. | 150 |
| Nov. 30 | 3 | Rotor on top-tram motor burnt out. | 400 |
| Year | 17¼ | | 1975 |

3. ANALYSIS:

a. Average Mine Analysis on Output for Year 1931:

| Grade | Iron | Phos. | Silica |
|---|---|---|---|
| Cliffs Shaft Lump | 58.66 | .116 | 8.01 |
| Cliffs Shaft Crushed | 55.87 | .111 | 10.80 |
| Bancroft Lump | 60.53 | .104 | 5.59 |
| Bancroft Crushed | 58.35 | .110 | 8.11 |
| Bancroft Run-of-Mine | 57.84 | .105 | 8.36 |
| Cliffs Shaft Run-of-Mine | 59.80 | .121 | 5.85 |

c. Ores in Stock Dec. 31st, 1931:

| Grade | | Iron | Phos. | Silica | Moist. |
|---|---|---|---|---|---|
| Bancroft Lump | Dried | 60.32 | .110 | 6.44 | |
| | Natural | 60.02 | .109 | 6.41 | .50 |
| Bancroft Crushed | Dried | 57.49 | .110 | 9.12 | |
| | Natural | 56.39 | .108 | 8.94 | 2.00 |
| Cliffs Shaft Lump | Dried | 59.75 | .109 | 6.71 | |
| | Natural | 59.45 | .108 | 6.68 | .50 |
| Cliffs Shaft Crushed | Dried | 56.33 | .109 | 10.17 | |
| | Natural | 55.20 | .107 | 9.97 | 2.00 |

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4. ESTIMATE OF ORE RESERVES:

Note:- Estimate is made as of Nov. 30th, 1931.

a. Ore in Sight - Cliffs Shaft Grade:

| | | Total Developed Tons | Prospective Tons | Available Tons | Unavailable Tons |
|---|---|---|---|---|---|
| "A" Shaft | Pillars | 1,676,400 | 24,000 | 543,900 | 1,108,500 |
| | Floors | 1,712,200 | | 789,900 | 922,300 |
| | Gross Total | 3,388,600 | 24,000 | 1,333,800 | 2,030,800 |
| "B" Shaft | Pillars | 763,400 | 12,000 | 40,000 | 711,400 |
| | Floors | 789,600 | | 263,800 | 525,800 |
| | Gross Total | 1,553,000 | 12,000 | 303,800 | 1,237,200 |
| GRAND GROSS TOTAL "A" AND "B" SHAFTS | | 4,941,000 | 36,000 | 1,637,600 | 3,268,000 |
| Less 10% Rock and 10% Loss in Mining | | | 6,800 | 311,100 | |
| CLIFFS SHAFT NET TOTAL | | | 29,200 | 1,326,500 | |

SUMMARY:

| | | |
|---|---|---|
| Prospective | 29,200 | Tons |
| Available | 1,326,500 | " |
| GRAND NET TOTAL AVAILABLE | 1,355,700 | " |

a. Ore in Sight - Bancroft Grade:

| | Total Developed Tons | Prospective Tons | Available Tons | Unavailable Tons |
|---|---|---|---|---|
| Pillars | 203,200 | 6,000 | 102,100 | 95,100 |
| Floors | 165,500 | | 117,300 | 48,200 |
| Gross Total | 368,700 | 6,000 | 219,400 | 143,300 |
| Less 10% Rock and 10% Loss in Mining | | 1,100 | 41,700 | |
| BANCROFT NET TOTAL | | 4,900 | 177,700 | |

SUMMARY:

| | | |
|---|---|---|
| Prospective | 4,900 | Tons |
| Available | 177,700 | " |
| GRAND NET TOTAL AVAILABLE | 182,600 | " |

Assumptions:-
8, 9 and 10 cu. ft. equals one ton.
10% deduction for rock.
10% deduction for loss in mining.
No Bessemer ore.

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4. ESTIMATE OF ORE RESERVES: (Continued)

ORE RESERVES AS REPORTED TO STATE TAX COMMISSION:

Summary of Ore Reserves:

| | | |
|---|---|---|
| Non-Bessemer: | | |
| Cliffs Shaft Available Reserves as of Nov. 30th, 1931. | 1,355,700 | Tons |
| Less December Production | 12,878 | " |
| NET TOTAL AVAILABLE | 1,342,822 | " |
| Non-Bessemer: | | |
| Bancroft Available Reserves as of Nov. 30th, 1931. | 182,600 | Tons |
| Less December Production | 2,972 | " |
| NET TOTAL AVAILABLE | 179,628 | " |
| GRAND NET TOTAL | 1,522,450 | Tons |

The following table gives the ore in sight on Dec. 1st; the product for the fiscal year; the balance in sight and the new ore developed during the year.

| | 1928 | 1929 | 1930 | 1931 |
|---|---|---|---|---|
| Estimated Available Ore in Mine Dec. 1st | 1,392,000 | 1,358,000 | 1,388,316 | 1,506,700 |
| Production | 399,109 | 414,419 | 412,786 | 303,638 |
| Balance | 992,891 | 943,581 | 975,530 | 1,203,062 |
| Ore in Mine Nov. 30th | 1,358,000 | 1,388,316 | 1,506,700 | 1,538,300 |
| New Ore Developed | 365,109 | 444,735 | 531,170 | 335,238 |
| Excess Over Production | 34,000 | 30,316 | 118,384 | 31,600 |

Analysis of Ore Reserves:

| Run-of-Mine Ore: | Iron | Phos. | Sil. | Mang. | Alum. | Lime | Mag. | Sul. | Ign. | Moist |
|---|---|---|---|---|---|---|---|---|---|---|
| Dried | 58.30 | .108 | 6.71 | .400 | 2.45 | 1.50 | 1.20 | .018 | 2.25 | |
| Natural | 57.02 | .106 | 6.56 | .392 | 2.40 | 1.47 | 1.17 | .018 | 2.20 | 2.20 |

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5. LABOR AND WAGES:

a. Comments:

(1) Labor:

Because of the scarcity of jobs, labor turnover was down to a minimum. Furthermore the efficiency factor shows an increase, as is apparent in the tables found later in this report.

b. Comparative Statement of Wages and Product:

| | 1931 | 1930 | Increase | Decrease |
|---|---|---|---|---|
| PRODUCT | 291,057 | 407,925 | | 116,868 |
| No. of Shifts & Hours | 1-8 | 1-8 | | |
| No. of Days Operated | 201 | 295 | | 94 |
| AVG. NO. OF MEN EMPLOYED: | | | | |
| Surface | 67 | 64 | 3 | |
| Underground | 245 | 241 | 4 | |
| Total | 312 | 305 | 7 | |
| AVG. WAGES PER DAY: | | | | |
| Surface | 4.36 | 4.45 | | .09 |
| Underground | 4.90 | 5.02 | | .12 |
| Total | 4.77 | 4.90 | | .13 |
| WAGES PER MONTH OF 25 DAYS: | | | | |
| Surface | 109.00 | 111.25 | | 2.25 |
| Underground | 122.50 | 125.50 | | 3.00 |
| Total | 119.25 | 122.50 | | 3.25 |
| WAGES PER MONTH OF 22 DAYS: | | | | |
| Surface | 95.92 | 97.90 | | 1.98 |
| Underground | 107.80 | 110.44 | | 2.64 |
| Total | 104.94 | 107.80 | | 2.86 |
| WAGES PER MONTH OF 17 DAYS: | | | | |
| Surface | 74.12 | 75.65 | | 1.53 |
| Underground | 83.30 | 85.34 | | 2.04 |
| Total | 81.09 | 83.30 | | 2.21 |
| WAGES PER MONTH OF 13 DAYS: | | | | |
| Surface | 56.68 | 57.85 | | 1.17 |
| Underground | 63.70 | 65.26 | | 1.56 |
| Total | 62.01 | 63.70 | | 1.69 |
| WAGES PER MONTH OF 9 DAYS: | | | | |
| Surface | 39.24 | 40.05 | | .81 |
| Underground | 44.10 | 45.18 | | 1.08 |
| Total | 42.93 | 44.10 | | 1.17 |

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5. LABOR AND WAGES: (Continued)

b. Comparative Statement of Wages and Product: (Continued)

| | 1931 | 1930 | Increase | Decrease |
|---|---|---|---|---|
| PRODUCT PER MAN PER DAY: | | | | |
| Surface | 18.75 | 20.08 | | 1.33 |
| Underground | 5.52 | 5.65 | | .13 |
| Total | 4.26 | 4.41 | | .15 |

Following is the comparison since 1925:-

| Year | Surface | Underground | Total |
|---|---|---|---|
| 1925 | 18.32 | 5.91 | 4.47 |
| 1926 | 19.37 | 5.91 | 4.53 |
| 1927 | 22.00 | 6.19 | 4.85 |
| 1928 | 20.53 | 5.80 | 4.52 |
| 1929 | 20.67 | 5.86 | 4.56 |
| 1930 | 20.08 | 5.65 | 4.41 |
| 1931 | 18.75 | 5.52 | 4.26 |

| | 1931 | 1930 | Increase | Decrease |
|---|---|---|---|---|
| LABOR COST PER TON: | | | | |
| Surface | .232 | .222 | .010 | |
| Underground | .888 | .890 | | .002 |
| Total | 1.120 | 1.112 | .008 | |
| AVG. PRODUCT STOPING & TRAM. | 10.32 | 9.95 | .37 | |
| AVG. WAGES CONTRACT MINERS | 5.24 | 5.43 | | .19 |
| AVG. WAGES CONTRACT LABOR | 5.33 | 5.55 | | .22 |
| TOTAL NUMBER OF DAYS: | | | | |
| Surface | 15,517¼ | 20,309 | | 4,791¾ |
| Underground | 52,719¼ | 72,248½ | | 19,529¼ |
| Total | 68,236½ | 92,557½ | | 24,321 |
| AMOUNT FOR LABOR: | | | | |
| Surface | 67,696.62 | 90,413.24 | | 22,716.62 |
| Underground | 258,405.18 | 362,984.54 | | 104,579.36 |
| Total | 326,101.80 | 453,397.78 | | 127,295.98 |

PROPORTION OF SURFACE TO UNDERGROUND MEN:

1928 - 1 to 3.67
1929 - 1 to 3.66
1930 - 1 to 3.76
1931 - 1 to 3.66

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6. SURFACE:

a. Buildings and Repairs:

Repairs to buildings were held down to a minimum, only $ 1500 having been spent on the entire plant.

Dry:

A small addition was built on the east side of the dry-house, near the south entrance, to house the tools and supplies for the timber-gang, pipemen and scraper-repair gang.

Crusher Building:

A room was partitioned off in the top of the crusher building for the man that dumps the top-tram cars. A small shelter was also built on the stockpile track level for the lander that operates the lump ore stocking car.

Top-Tram Plant:

The top-tram haulage equipment that operates the lump ore car was moved from the west end of the stockpile grounds to a new location just east of the crusher building. It was necessary to do this because the old site will be covered with Bancroft Lump ore and furthermore the new location is best because only half as much top-tram rope will be required as formerly and all of the old angle sheaves have been eliminated.

Engine-House:

Painting the machinery and the interior of the engine-house was finished early in the year.

New double doors were hung on both sides of the building.

b. Stockpiles:

Because most of the regular stocking area was filled with ore carried over from last season, it was necessary to plan to use the old stockpile grounds south of the Deer Lake Branch of the C. & N.W. Ry. for stocking crushed ore and to grade and plank another area for lump ore. The C. & N.W. Ry. abandoned the Deer Lake Branch track and gave us permission to cover it with stockpile ore.

7. UNDERGROUND:

b. Development:

We carried on an intensive development campaign because of the poor demand for ore and because we had to provide jobs for quite a number of old Holmes Mine employees. Following are the number of feet of ore and rock drifts and raises for the past six years:-

| | | |
|---|---|---|
| 1931 | - | 6791 Ft. |
| 1930 | - | 10200 " |
| 1929 | - | 8525 " |
| 1928 | - | 6610 " |
| 1927 | - | 7368 " |
| 1926 | - | 5958 " |

Note:- If 1931 had been a full time year, we would have shown a footage on a par with 1930.

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7. UNDERGROUND:
(Continued)

b. Development: (Continued)

Four major development projects were in progress during the year; the opening up of the new Bancroft Vein on the tenth and fifteenth levels; drifting towards the old East New York property on the eighth and tenth levels; drifting towards the Section 3 ore-body on the fifteenth level and also starting to open up the west end of Section 9 explored by diamond drill twenty years ago.

The average classification of contracts for the past year follows:-

| | |
|---|---|
| Developing Contracts | 39 |
| Mining Known Reserves | 32 |
| Miscellaneous (Barring, Etc.) | 3 |
| Total | 74 |

It is evident from the tabulation of the ore reserves that more than the usual amount of development work has been done for the past three years because we have not only proven up as much ore as the total we had in sight on Jan. 1st, 1929, but we have proven up 180,000 tons more than we have hoisted in the last three years.

The development work in detail follows:-

First Level "B" Shaft:

In order to improve the method of handling rock on the night shift, we decided to get "B" shaft in shape to dump rock. Most of the rock work, about 75%, is tributary to "B" shaft, but all of it was actually being hoisted and dumped in "A" shaft. The "A" shaft pocket will only hold a skip load or two, no storage being provided. This will also be changed.

A crosscut was driven back of "B" shaft and a raise put up to the north, holing into the side of the shaft, 50 feet above the level. Another raise was holed from the second level into the bottom of the drift opposite the raise on the first level. That means that we can tram rock on either the first or second level and store all the rock hoisted at night and distribute it by day. The skips on the night shift can be hoisted as fast as they are loaded because we will have storage for all the rock that can possibly be hoisted at night.

Second Level "A" Shaft: Bancroft Vein:

Contract No. 34, 800 feet northeast of "A" shaft, followed the vein they discovered in 1930 to the south and west until it petered out. They also started two raises on the footwall. The ore in the back of the stope does not look very promising, but there is still a fine breast to follow northeast when the back plays out.

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7. UNDERGROUND:
(Continued)

b. Development: (Continued)

Third Level "B" Shaft: North Vein:

Contract No. 72 did quite a lot of development in ore 400 feet northwest of "B" shaft. They followed the lens discovered last year and also cross-cutted south and opened up a new lens that was first discovered by old Diamond-Drill Hole No. 106. There is no ore in the backs of the new stopes, but there is good ore in the floors.

Fourth Level "A" Shaft: Bancroft Vein:

A short drift was driven north from the side of the old stope along the course of Diamond-Drill Hole No. 397 by Contract No. 22.

Fourth Level "A" Shaft: North Vein:

Just to the west of the southwest corner of the Bancroft Lease, No. 30 opened up a nice stope around their new raise coming up from the fifth level.

Fifth Level "A" Shaft: Bancroft Vein:

In the extreme southeast corner of the Bancroft Lease, Nos. 51, 61 and 66 extended the limits of this deposit. The entire area, including No. 32 and No. 51, mining in the North Vein on the east side of the Bancroft Lease is fully developed. Contract No. 61 followed the ore up on the north foot until they reached almost to the third level elevation.

Fifth Level "A" Shaft: Southeast Vein:

Contract No. 4 extended their hanging-wall drift 150 feet farther east until the breast was almost directly under the New Ishpeming Hospital. The drift was stopped early in the year and the plan is now to diamond drill for the ore found both north and south of the drift by old drill-holes drilled from the old Moro and Incline Mines.

Sixth Level "A" Shaft:

The development work on this level in both "A" and "B" shafts was productive of results.

North Vein:

Three gangs, Nos. 8, 23 and 28, found considerable ore. No. 8 not only opened up a new lens back of the foot of their old stope on the level, but also greatly increased the known limits of the ore on the sub 75 feet above the level. They also put up a new raise in ore connecting the sub with the new lens back in the foot. All this work was done between the 3000 and 3400 East coordinate line.

Contract No. 23 failed to find any ore in their raise near the 2900 East coordinate line, but did extend the limits of the known ore areas near the 3000 East coordinate line.

Contract No. 28 found two new lenses, one north and the other south of the 200 South coordinate line. The former gives promise of opening up in good shape because the ore seems to be making both up and down.

On the west side of the level, Contract No. 40 extended their new stope 80 feet farther west.

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7. UNDERGROUND:
(Continued)

b. Development: (Continued)

Sixth Level "A" Shaft: (Continued)

Incline Vein:

No. 12 extended their breast stope 80 feet further northeast and at the end of the year were still breasted in high grade ore.

Sixth Level "B" Shaft:

Two contracts, Nos. 33 and 37, did development work in this section of the mine.

North Vein:

No. 37 extended their exploratory drift 270 feet to the west along the hanging. Some stringers of ore were discovered, but no worthwhile ore-body was cut. At the end of the year we turned the drift north to get farther away from the quartzite hanging and closer to the jasper foot. The intention is to explore from the hanging back into the foot by diamond drilling.

Fault Vein:

No. 33 discovered a nice deposit 500 feet southwest of "B" shaft, which, however, pinched out. At the end of the year raising was in progress to look for the ore found by an old drill hole between the third and sixth levels.

Seventh Level "A" Shaft: North Vein:

With the exception of No. 67 contract, no other contract on the seventh level discovered anything new. No. 67 extended their new breast stope, in the extreme east end of the vein, over to the 3300 east coordinate line and also followed a nice lens south and southwest on the 3200 East coordinate line.

Eighth Level "A" Shaft:

Every contract, but one, No. 15, was doing development work on this level.

Bancroft Vein:

In the southeast corner of the vein No. 10 extended their breast stope both east and west. On the west side the hanging came down so low that it was decided to mine the ore from No. 15's raise. On the east side the breast became badly mixed with jasper.

North Vein:

No. 25 contract, located a short distance east of the east side of the Bancroft Lease, drifted north along Diamond-Drill Hole No. 417 and cut two nice lenses of ore. The first one was developed by No. 44 and the one farthest north by No. 25. In both cases stopes were started on both sides of the drill hole.

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7. UNDERGROUND:
(Continued)

b. Development: (Continued)

Eighth Level "A" Shaft: (Continued)

North Vein:

On the west side of the vein No. 4 is exploring and drove a drift south towards the main fault. The back of the drift is in ore and at the end of the year the breast was turned west to develop a nice vein of ore cut on the west side of the drift.

In the southeast corner of the North Vein No. 44 after breast stoping east for 70 feet, put up two raises in ore to the seventh level in the same vein.

Eighth Level "B" Shaft:

500 feet northeast of "B" shaft No. 57 contract after drifting through rock for 50 feet encountered a leader of ore, which led east to the stope which they opened during the year. The new stope developed was about 90 feet long and 30 feet wide and there is high grade ore in both the back and floor.

On the west side of the shaft, No. 69 extended the straight crosscut running northwest from the shaft and put up a new raise for No. 36's stope on the level above. 200 feet further south the hanging-wall drift was extended to the north and east, looking for the ore shown up in Diamond-Drill Hole No. 95, but we found only a narrow stringer.

Ninth Level "A" Shaft: Main Vein:

No. 44 contract followed the ore discovered late last year. They stoped 140 feet farther east, being breasted close to the 3200 East coordinate line at the end of the year 1931.

Tenth Level "A" Shaft: Bancroft Vein:

Two gangs, Nos. 10 and 64, continue to add new tonnage to our ore reserves. The former after drifting west for 200 feet in rock, but having ore all over the back of the drift, turned north and cut the ore discovered in Diamond-Drill Hole No. 421. On the east side of the Bancroft Lease No. 64 continued to drift west in ore for 330 feet. At the end of the year the breast of the drift was close to the east line of the lease.

Tenth Level "B" Shaft: Fault Vein:

No. 14 contract opened up quite a lot of new territory between the 1400 and 1600 West coordinate lines, but at the end of the year had exhausted most of the possibilities on the level itself. There is a fine floor of ore left which must be mined by drifting and raising from the eleventh level.

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7. UNDERGROUND:
(Continued)

b. Development: (Continued)

Tenth Level "B" Shaft: New Section Nine Deposit:

Contract No. 47 drifted west 230 feet towards the ore-body known to exist on the Northwest Quarter of Section 9. In December the drift ran out of the dike footwall and encountered a well defined slip along the jasper, which we turned to follow.

Eleventh Level "A" Shaft: Main Vein:

Two gangs, No. 3 in the southwest corner and No. 11 in the southeast end of the Main Vein, developed quite a lot of new ore. The latter contract after running out of ore drifted east to come under the ore shown in Diamond-Drill Hole No. 34 on the tenth level.

Twelfth Level "A" Shaft:

No. 5 contract started to drift from the southeast corner of the Main Vein towards the ore found by No. 3 on the eleventh level. By the end of the year they were breasted close to the point where the ore might be expected to be found.

Fifteenth Level "A" Shaft: Bancroft Vein:

By the end of 1931, No. 58 had their main level drift nearly into the objective point. They had passed from the limits of the Cliffs Shaft Mine over onto the Bancroft Lease and were close to the ore discovered in Diamond-Drill Hole No. 422, in which ore we expect to raise and hope it connects with the Bancroft Vein on the tenth level. The material in the drift has alternated between dike and siderite, the latter being very hard.

Fifteenth Level "B" Shaft: Section Three Drift:

Contract No. 71 extended their drift 567 feet closer to the Section 3 shaft site. At the end of the year they were 1811 feet from "B" shaft and 2989 feet from the proposed site of the new shaft on Section 3. Most of the drifting in 1931 was done in footwall dike.

In order to protect the mine from a sudden rush of water that might be struck in the new drift, the concrete dam partially built the year before was finished. Stop logs have been taken to the dam site and valves and blank flanges placed on the pipes that run through the dam.

c. Stoping:

The miners in the Cliffs Shaft Mine never broke as much ore per day as they did the last six months of 1931. This was due to the fact that we tried to keep the breasts of the stopes cleaned out in order to allow the miners to drill the next round more readily. The men also had better supervision in 1931 and the fact that labor was plentiful contributed to the increased efficiency. The following table shows how the tons per man stoping increased.

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7. UNDERGROUND:
(Continued)

c. Stoping: (Continued)

| Year | Tons Per Man Stoping |
|---|---|
| 1931 (Last 6 Mos.) | 28.85 |
| 1931 (First 6 Mos.) | 21.14 |
| 1930 | 23.80 |
| 1929 | 22.41 |
| 1928 | 21.10 |
| 1927 | 21.63 |
| 1926 | 20.93 |
| 1925 | 20.44 |
| 1924 | 16.30 |
| 1923 | 17.26 |
| 1922 | 16.49 |
| 1921 | 15.26 |
| 1920 | 13.95 |

It will be noted that the increase was remarkable and would have been even more if we had shipped more freely from the pockets whereby we would have received credit for the overrun, which ran over 15% on the small amount of ore shipped.

Subs Above First Level "B" Shaft: Main Vein:
Contracts Nos. 17 and 18 stoped on the 1145, 1180, 1205 and 1220 foot sub-levels southeast and southwest of "B" shaft. Contract No. 17 took out the ore discovered by Diamond-Drill Hole No. 284 and did not raise over ten feet above the floor of the sub in order to be sure to leave enough back to support the surface.

First Level "A" Shaft: Bancroft Vein:
Two contracts, Nos. 9 and 34, mined ore along the south side of the Bancroft Lease directly north of "A" shaft. No. 9 mined floors, while No. 34 continued to raise and crosscut on the foot, but in no case did they exceed the limit of mining established at a point 50 feet above the level.

First Level "A" Shaft: North Vein:
No. 9 mined out a small area of floor left between the first and second levels 525 feet northeast of "A" shaft.

First Level "A" Shaft: Main Vein:
Contract No. 9 also drove a short crosscut and took out developed reserves 400 feet northwest of "A" shaft.

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7. UNDERGROUND:
(Continued)

c. Stoping: (Continued)

First Level "B" Shaft:

Southeast Vein:

In the extreme southeast corner of the first level, Contracts Nos. 1, 35 and 63 stoped ore off the foot and also mined out the backs of the old stopes preparatory to taking out the floors.

Second Level "A" Shaft:

North Vein:

No. 30 mined out a piece of floor between the second and third levels close to the south line of the Bancroft Lease, 600 feet northeast of "A" shaft.

Main Vein:

No. 27 contract, one of the best gangs in the mine, mined a large floor area below the second level along the south side of the Main Vein between the 300 and 500 East coordinate lines.

Third Level "A" Shaft:

Bancroft Vein:

Two contracts, Nos. 22 and 29, are mining in the south central part of the Bancroft Lease. Both are taking out known reserves.

North Vein:

In the extreme west end of the North Vein between the second and fourth levels, Contract No. 30 mined both backs and floors in the old stopes opened up years ago.

Fifth Level "A" Shaft:

North Vein:

Two gangs, Nos. 42 and 49, mined known reserves in the north part of the North Vein northwest of "A" shaft. No. 42 worked on floors between the fifth and sixth levels, while No. 49 stoped around their new raise put up from the seventh level.

Southeast Vein:

Nos. 2 and 6 are still mining in the same areas as last year, continuing to deplete the reserves in the Southeast Vein. The former robbed floors and arches on their old subs, while the latter took out the ore left between the fifth and sixth levels in the west end of the vein.

Sixth Level "A" Shaft:

North Vein:

In the central part of the North Vein, three gangs, Nos. 16, 52 and 59, were employed. The first gang stope raised, while the others mined floors.

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7. UNDERGROUND:
(Continued)

c. Stoping: (Continued)

Sixth Level "A" Shaft:

Southeast Vein:

In the southeast corner of this vein No. 45 continued to mine the floors between the sixth and seventh levels.

Sixth Level "B" Shaft:

Two gangs, No. 19 in the southwest end of the level and No. 40 in the northeast corner, mined floors. The former worked in the Fault Vein and the latter in the North Vein.

Seventh Level "A" Shaft:

Bancroft Vein:

No. 62 mined a part of the floor in old 61's stope in the south central part of the vein.

North Vein:

Four gangs, Nos. 16, 20, 52 and 54, mined in the north part of the North Vein close to the south boundary of the Bancroft Lease. Nos. 16 and 54 on the west end extended the known limits of the ore areas, but Nos. 20 and 52 mined developed reserves.

Seventh Level "B" Shaft:

North Vein:

Two gangs, both northwest of the shaft, extended the known limits of their stopes. No. 13, 350 feet northwest of the shaft, opened up a stope 100 feet long and 40 feet wide, and No. 36 raised up on the foot near the 600 West coordinate line.

Main Vein:

In the east end of the Main Vein No. 38 mined out quite a large area around their raise and also breast stoped west on a sub between the seventh and eighth levels.

In the central part of the Main Vein, No. 19 after mining known reserves, also raised up on the foot above the seventh level and found quite a large lens of new ore back of the old foot.

Eighth Level "A" Shaft:

Bancroft Vein:

On the east side of the vein and close to the south boundary of the Bancroft Lease, No. 15 mined out a floor 130 feet long in old No. 10's stope.

Southeast Vein:

No. 41, after outlining the limits of the ore on the eighth level, took out practically all of the ore left in the back of their stope.

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7. UNDERGROUND:
(Continued)

c. Stoping: (Continued)

Ninth Level "A" Shaft:

Main Vein:

Three gangs took out floors between the ninth and tenth levels. Most of the available floors have now been mined on the west side of the vein and but little ore remains to be mined on the east end.

Tenth Level "A" Shaft:

Main Vein:

The central portion of the vein was mined by six different contracts during 1931. These gangs numbered from west to east were as follows, No. 7, No. 39, No. 11, No. 21, No. 50 and No. 70. All of these gangs except No. 70 were depleting contracts, that is, all of them mined ore within the known limits of the vein. No. 70 extended their breast stope further east.

South Lens:

No. 3 holed two new raises from the eleventh level into the floor of old No. 7's stope on the sub-level above the tenth level.

Eleventh Level "A" Shaft:

Main Vein:

In the central part of the Main Vein No. 11 is taking the tenth level floor and also stoped out some of the back lying over the stopes on the eleventh level.

Twelfth Level "B" Shaft:

Main Vein:

Two gangs, Nos. 31 and 43, mined floors in the south portion of the Main Vein.

Fault Vein:

No. 48 took out all the available ore in their raising stope between the eleventh and twelfth levels and by mid-year had exhausted all the possibilities in this vein.

Thirteenth Level "B" Shaft:

Main Vein:

Nos. 46 and 48 continued to mine floors between the thirteenth and fourteenth levels and most of the available ore on this level has now been mined.

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7. UNDERGROUND:
(Continued)

e. Drifting and Raising:

The total footage drifted and raised in 1931 will naturally be less than previous years because of the shorter working schedule. Following are figures for the past six years:-

| Year | Rock Drifts & Raises | Ore Drifts & Raises | Total |
|---|---|---|---|
| 1931 | 3577' | 3212' | 6729' |
| 1930 | 6496' | 3704' | 10200' |
| 1929 | 5443' | 3082' | 8525' |
| 1928 | 4762' | 1848' | 6610' |
| 1927 | 4874' | 2494' | 7368' |
| 1926 | 3051' | 2907' | 5958' |

f. Explosives, Drilling and Blasting:

Explosives Statement for 1931:

Stoping and Development in Ore:

| Kind | Quantity | Average Price | Amount 1931 | Amount 1930 |
|---|---|---|---|---|
| Gelamite "A" | 9850 | 12.75 | 1255.89 | |
| Gelamite 2X | 19000 | 12.75 | 2422.50 | |
| 50% L.F. Powder | 124596 | 12.27 | 15287.52 | 27918.13 |
| 60% L.F. Powder | 92250 | 13.25 | 12223.11 | 18115.27 |
| 60% Gelatine | 2050 | 13.75 | 281.87 | |
| Total Powder | 247746 | 12.70 | 31470.89 | 46033.40 |
| Caps | 66616 | 11.643M | 775.64 | 1197.18 |
| Fuse | 348542 | 5.684M | 1980.67 | 2855.65 |
| Connecting Wire | 8 | .645 | 5.16 | |
| Delay Fuses | 154 | 12.37 C | 19.05 | |
| Fuse Lighters | 3637 | 8.847M | 32.18 | |
| Crimpers | 5 | .75 | 3.75 | .71 |
| Fuse Containers | 1 | | 2.25 | |
| Tamping Bags | 22500 | 2.15 M | 48.38 | |
| Prop. Cost Blasting Machine | | | 17.50 | |
| Total Fuse, Etc. | | | 2884.58 | 4053.54 |
| Total All Explosives | | | 34355.47 | 50086.94 |
| Product | | | 291057 | 407925 |
| Pounds Powder per Ton of Ore | | | .8512 | .8738 |
| Cost per Ton for Powder | | | .108 | .1128 |
| Cost per Ton for Fuse, Etc. | | | .010 | .0099 |
| Cost per Ton for All Explosives | | | .118 | .1227 |

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7. UNDERGROUND:
(Continued)

f. Explosives, Drilling and Blasting: (Continued)
Explosives Statement for 1931: "
Development in Rock and No. 3 Drift:

| | Quantity | Average Price | Amount 1931 | Amount 1930 |
|---|---|---|---|---|
| Gelamite "A" | 9300 | 12.749 | 1185.74 | |
| Gelamite 2X | 250 | 12.75 | 31.88 | |
| 50% L.F. Powder | 6050 | 12.25 | 741.13 | 1162.39 |
| 60% L.F. Powder | 36900 | 13.25 | 4889.26 | 12756.87 |
| 60% Gelatine | 10650 | 13.74 | 1464.37 | |
| Total Powder | 63150 | 13.162 | 8312.38 | 13919.26 |
| Caps | 12854 | 11.80 | 151.69 | 310.72 |
| Fuse | 83916 | 5.643 | 473.56 | 817.26 |
| Connecting Wire | 1 | | .64 | |
| Delay Fuses | 71 | 12.33 | 8.76 | |
| Fuse Lighters | 813 | 9.126 | 7.42 | |
| Crimpers | 1 | | .75 | |
| Fuse Containers | 1 | | 2.25 | |
| Tamping Bags | 7400 | 2.148 | 15.90 | |
| Prop. Cost Blasting Machine | | | 17.50 | |
| Total Fuse, Etc. | | | 678.47 | 1127.98 |
| Total Explosives - Development in Rock | | | 8990.85 | 15047.24 |
| TOTAL EXPLOSIVES USED AS PER COST SHEET | | | 43346.32 | 65134.18 |
| Average Cost per Pound for Powder | | | .127 | .1303 |

It will be noted that the cost per ton for powder used to break ore in 1931 was about 1½¢ less than for the previous year. The saving was actually more than that because we shipped 123,000 tons less from the pockets in 1931, and if shipments from pockets had been on a par with 1930, the overrun would have added at least 15,000 tons to the year's figures, and further decreased the cost per ton for explosives 1/2¢. The decreased cost is due almost entirely to the elimination of most of the bulldozing of the ore chunks by purchasing block-holing machines and insisting that all large pieces of ore be drilled first and then blasted.

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8. COST OF OPERATING:

a. Comparative Mining Costs:

| | 1931 | 1930 | Increase | Decrease |
|---|---|---|---|---|
| PRODUCT | 291,057 | 407,925 | | 116,868 |
| Underground Costs | 1.511 | 1.513 | | .002 |
| Surface Costs | .223 | .214 | .009 | |
| General Mine Accounts | .316 | .233 | .083 | |
| Cost of Production | 2.050 | 1.960 | .090 | |
| Depreciation | .055 | .052 | .003 | |
| Taxes | .553 | .359 | .194 | |
| Loading & Shipping | .013 | .024 | | .011 |
| Total Cost at Mine | 2.671 | 2.395 | .276 | |

The underground and surface costs for 1931 totaled only 3/4¢ more per ton than for 1930, and this in spite of the fact that the mine operated on a 1/3 less working time. The distributive items or expenses charged to us by the Ishpeming and Cleveland offices and the taxes increased 27¢ per ton for the year 1931.

b. Detailed Cost Comparison:

| | | 1931 | | 1930 | | Increase | | Decrease | |
|---|---|---|---|---|---|---|---|---|---|
| | | Amount | Per Ton | Amount | Per Ton | Amount | Per Ton | Amount | Per Ton |
| A | Exploring in Mine | 7251.84 | .025 | 11421.92 | .028 | | | 4180.08 | .003 |
| B | Development in Rock | 39703.74 | .136 | 73464.37 | .180 | | | 33760.63 | .044 |
| C | Development in Ore | 28464.81 | .098 | 32471.93 | .080 | | .018 | 4007.12 | |
| D | Stoping | 104726.82 | .360 | 156385.26 | .383 | | | 51658.44 | .023 |
| E | Timbering | 9191.32 | .032 | 14550.86 | .036 | | | 5359.54 | .004 |
| F | Tramming | 108821.40 | .374 | 142366.15 | .349 | | .025 | 33544.75 | |
| G | Pumping | 25812.81 | .089 | 30067.03 | .074 | | .015 | 4254.22 | |
| H | Compressors & Air Pipes | 27885.80 | .096 | 41013.92 | .100 | | | 13128.12 | .004 |
| I | Back Filling | 7933.40 | .027 | 14843.43 | .036 | | | 6910.03 | .009 |
| J | Underground Superintendence | 17181.86 | .059 | 19268.30 | .047 | | .012 | 2086.44 | |
| K | Compressors & Power Drills | 9475.33 | .033 | 4880.53 | .012 | 4594.80 | .021 | | |

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8. COST OF OPERATING: (Continued)

b. Detailed Cost Comparison: (Continued)

| | | 1931 | | 1930 | | Increase | | Decrease | |
|---|---|---|---|---|---|---|---|---|---|
| | | Amount | Per Ton | Amount | Per Ton | Amount | Per Ton | Amount | Per Ton |
| L | Hand Tram Equipment | 3760.30 | .018 | 46514.87 | .114) ) ) | | | | |
| M | Scrapers & Mech. Equipt. | 24200.23 | .082 | | ) | | | 18554.34 | .019 |
| N | Electric Tram Equipt. | 23072.04 | .079 | 28172.14 | .069 | | .010 | 5100.10 | |
| O | Pumping Machinery | 2225.80 | .008 | 1506.30 | .004 | 719.50 | .004 | | |
| P | Hoisting | 15913.27 | .055 | 21356.60 | .055 | | | 5443.33 | .000 |
| Q | Stocking Ore | 10935.14 | .038 | 11051.75 | .027 | | .011 | 116.61 | |
| R | Screening & Crushing | 13392.10 | .046 | 19009.18 | .045 | | .001 | 5617.08 | |
| S | Dry House | 4981.57 | .017 | 7755.70 | .019 | | | 2774.13 | .002 |
| T | General Surface Exp. | 7348.15 | .025 | 10826.68 | .026 | | | 3478.53 | .001 |
| U | Hoisting Equipment | 4357.87 | .015 | 7629.65 | .018 | | | 3271.78 | .003 |
| V | Shaft | 1512.58 | .006 | 2583.10 | .006 | | | 1070.52 | .000 |
| W | Top Tram Equipment | 1767.93 | .006 | 2382.73 | .006 | | | 614.80 | .000 |
| X | Docks, Trestles & Pockets | 3179.77 | .010 | 1080.58 | .003 | 2099.19 | .007 | | |
| Y | Mine Buildings | 1500.27 | .005 | 3785.72 | .009 | | | 2285.45 | .004 |
| Z1 | Insurance | 131.21 | .000 | 96.68 | .000 | 34.53 | .000 | | |
| Z2 | Mining Engineering | 4117.38 | .014 | 3423.32 | .008 | 694.06 | .006 | | |

CLIFFS SHAFT MINE
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8. COST OF OPERATING: (Continued)

b. Detailed Cost Comparison: (Continued)

| | | 1931 | | 1930 | | Increase | | Decrease | |
|---|---|---|---|---|---|---|---|---|---|
| | | Amount | Per Ton | Amount | Per Ton | Amount | Per Ton | Amount | Per Ton |
| Z3 | Mech. & Elect. Engineering | 2047.99 | .007 | 1821.05 | .004 | 226.94 | .003 | | |
| Z4 | Analysis & Grading | 5039.15 | .017 | 5148.35 | .013 | | .004 | 109.20 | |
| Z5 | Personal Injury | 18944.05 | .065 | 21482.33 | .054 | | .011 | 2538.28 | |
| Z6 | Safety Dept. | 1532.87 | .005 | 1714.09 | .004 | | .001 | 181.22 | |
| Z7 | Telephones & Safety Devices | 2794.10 | .010 | 3675.87 | .009 | | .001 | 881.77 | |
| Z8 | Local & General Welfare | 8647.26 | .030 | 7862.70 | .019 | 784.56 | .011 | | |
| Z9 | Special Exp., Pens. & Allows. | 16494.89 | .057 | 15516.97 | .038 | 977.92 | .019 | | |
| Z10 | Ishpeming Office | 19135.00 | .066 | 20349.24 | .050 | | .016 | 1214.24 | |
| Z11 | Mine Office | 13179.80 | .045 | 13968.24 | .034 | | .011 | 788.44 | |

Most of the above accounts naturally show a decrease in cost because of the fact that the mine is operating on a restricted schedule. No attempt will be made this year to explain the reason for the decreases in each individual case because the years 1930 and 1931 cannot be properly compared because of the difference in working time. Detailed explanations, however, will be given where the decreases or increases are not in line with the decrease in the number of working days.

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8. COST OF OPERATING: (Continued)

b. Detailed Cost Comparison: (Continued)

B - DEVELOPMENT IN ROCK:

The footage drifted in rock for the year 1931 totaled 3577 feet at a cost of $ 11.10 a foot. In 1930 the footage was 6496 feet at a cost of $ 11.31 per foot.

C - DEVELOPMENT IN ORE:

The decrease in cost for 1931 is almost directly proportional to the decrease in the footage of ore drifts and raises. The unit cost per foot being practically identical for the two years.

D - STOPING:

A detail of the cost for the years 1930 and 1931 follows:-

| | 1931 | | 1930 | |
|---|---|---|---|---|
| | Amount | Cost Per Ton | Amount | Cost Per Ton |
| Contract Labor | 59630.86 | .224 | 86259.00 | .228 |
| Other Labor | 9631.81 | .036 | 13472.06 | .036 |
| Total Labor | 69262.67 | .260 | 99731.06 | .264 |
| Total Supplies | 35464.15 | .133 | 56654.20 | .150 |
| Total Labor & Supplies | 104726.82 | .393 | 156385.26 | .414 |
| General Supplies | 1142.27 | .004 | 1868.16 | .005 |
| Iron and Steel | 2330.91 | .009 | 5419.04 | .014 |
| Oil and Grease | 232.05 | .001 | 307.46 | .001 |
| Machinery Supplies | 4268.03 | .016 | 6537.88 | .017 |
| Explosives | 25680.55 | .096 | 39207.96 | .104 |
| Lumber and Timber | 183.74 | .001 | 308.26 | .001 |
| Sundries | 154.05 | .001 | 27.49 | .000 |
| Expense Accts. Distributed | 1472.55 | .005 | 2977.95 | .008 |
| Total | 35464.15 | .133 | 56654.20 | .150 |
| Tons | 266,037 | | 378,173 | |

The comparison of the two years shows that there is a decrease in the cost per ton for contract labor. There are also three supply items that show a decrease in the unit cost per ton, viz., Iron & Steel, Explosives and Expense Accts. Distributed. The biggest saving was in the explosives used and this is entirely due to the elimination of a great deal of the bulldozing by purchasing block-holing machines and insisting that all of the large chunks of ore are drilled before they are blasted.

F - TRAMMING:

The reduction in the tramming costs is not quite in the same proportion as the reduction in production, but the difference is due entirely to a change in the distribution of labor costs underground which were formerly charged to other accounts.

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8. COST OF OPERATING: (Continued)

b. Detailed Cost Comparison: (Continued)

G - PUMPING:

A detail of the pumping expense for the past two years follows:-

| | 1931 | 1930 |
|---|---|---|
| Pumpmen Labor | 6769.60 | 5134.20 |
| Other Labor | 310.28 | 609.59 |
| Total Labor | 7079.88 | 5743.79 |
| Oil, Waste and Packing | 282.67 | 259.03 |
| Tools and Miscellaneous Supplies | 13.46 | 43.15 |
| Electric Light | 326.70 | 307.41 |
| Electric Power | 18110.10 | 23713.65 |
| Total Supplies | 18732.93 | 24323.24 |
| Total Operating | 25812.81 | 30067.03 |

| | |
|---|---|
| Gallons Water Pumped - 1931 | 350,061,850 |
| " " " - 1930 | 446,650,100 |
| " " " - 1929 | 461,403,025 |
| " " " - 1928 | 463,182,750 |

You will note an increase in pumpmen's labor which does not mean that we have had any extra pumpmen, but does mean that pumpmen helpers are working with the pumpmen on the days that the mine is idle. The decrease in electric power was due to the fact that considerable less water was pumped in 1931. In 1930 we drained the old Incline and No. 3 Pits.

H - COMPRESSORS AND AIR PIPES:

Whereas the reduction in production for 1931 was 29%, the costs for Compressors and Air Pipes were decreased 32%. This is not only due to a more economical use of the compressed air underground, but also due to salvaging a great many pipes and fittings. The total cost for the two years is as follows:-

| | 1931 | 1930 |
|---|---|---|
| Labor | 3759.50 | 4056.25 |
| Tools & Miscellaneous Supplies | 16.55 | 12.65 |
| Electric Light | 120.79 | 120.00 |
| Cooling Pump | 203.37 | |
| Electric Power | 19750.20 | 30110.67 |
| Heating Expense | 505.38 | 450.00 |
| Oil, Waste and Packing | 216.91 | 338.58 |
| Total Supplies | 20813.20 | 31031.90 |
| Total Operating Expense | 24572.70 | 35088.15 |
| Cost per 1000 Ft. Operating | .042 | .040 |
| Cu. Ft. of Air Compressed | 592,506,000 | 896,693,000 |

CLIFFS SHAFT MINE
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8. COST OF OPERATING: (Continued)

b. Detailed Cost Comparison: (Continued)

H - COMPRESSORS & AIR PIPES: (Continued)

The expense for maintaining and extending air lines was only $ 3313.10 in 1931 compared with $ 5925.77 in 1930. This reduction is largely due to the waste campaign which resulted in the salvaging of hundreds of dollars of old pipe and fittings. The reduction in electric power for compressors was 37% compared with a 29% reduction in operations, due entirely to economy in the use of compressed air. Instead of running the compressor up until the middle of the shift when handling rock, the compressor since the latter part of February was only run about a quarter of a shift.

J - UNDERGROUND SUPERINTENDENCE:

Since the beginning of the year 1931, William Nault, formerly employed as Mining Captain at the Holmes Mine, was made Assistant to Captain John Olds at the Cliffs Shaft Mine, because the latter was laid up a long time with a serious illness. The adding of one more boss to the underground personnel increased the unit cost for Underground Superintendence.

K - COMPRESSORS AND POWER DRILLS:

The increase for 1931 is due entirely to new machines purchased during the year. In 1930 we bought eleven drifters, complete with oilers, which cost $ 3850.00. In 1931 we purchased and charged out twenty-three drifters at a cost of $ 8098.44 and six R-39 Jackhammers at a cost of $ 1025.51.

L-M - HAND TRAMMING EQUIPMENT & SCRAPERS & MECHANICAL EQUIPMENT:

This account shows a decrease of $ 18,554.34, which is larger proportionably than the decrease in production. The following is a list of the major portion of the supplies used during 1931.

| | | |
|---|---|---|
| 225 | Ft. 3/8" Wire Rope | $ 19.85 |
| 3625 | " 1/2" " " | 365.93 |
| 30732 | " 5/8" " " | 4807.83 |
| 1055 | " 3/4" " " | 231.58 |
| 2315 | " No. 6AGW 3 Conductor Electric Cable | 578.75 |
| 1220 | " No. 6 2 " Tirex " | 250.42 |
| 1000 | " No. 8 3 " " " | 250.00 |
| 3500 | " No. 16 2 " " Port. L. Cord | 187.63 |
| 2 | 15 H.P. Motors | 592.62 |
| 6 | Magnetic Switches | 149.40 |
| 8 | Type H 1½ KVA Transformers | 239.20 |
| | Repairing & Rewinding Armatures | 734.74 |
| 6 | 42" Manganese Scraper Blades | 156.30 |
| 23 | 48" " " " | 1065.24 |
| 16 | 48" " " Side Plates | 130.56 |
| | Total | $ 9760.05 |

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8. COST OF OPERATING: (Continued)

b. Detailed Cost Comparison: (Continued)

L-M - HAND TRAMMING EQUIPMENT & SCRAPERS & MECHANICAL EQUIPMENT: (Continued)

A comparison of the larger supply items for the last two years follows:-

| | 1931 | 1930 |
|---|---|---|
| Wire Rope | 5425.19 | 6403.81 |
| Scraper-Hoists | | 9352.87 |
| Scraper-Slides | 406.92 | 1173.93 |
| Cable | 1266.80 | 995.95 |
| Total | 7098.91 | 17926.56 |

We also estimate a saving of approximately $ 1800.00 in the salvaging of the old manganese blades for the scrapers, which were cut down from the 48" size to the 42" size. By more careful supervision of wire rope we saved another $ 800.00.

N - ELECTRIC TRAM EQUIPMENT:

Costs and detail for the two years follow:-

| | 1931 | 1930 |
|---|---|---|
| Generator and Dynamo | 44.83 | 686.76 |
| Locomotives | 8501.06 | 6452.56 |
| Wiring | 2740.46 | 3824.07 |
| Main Line Tracks | 6762.75 | 9251.70 |
| Main Line Cars | 4803.68 | 7531.26 |
| Spotting Engines | 219.26 | 425.79 |
| Total | 23072.04 | 28172.14 |

All of these items show decreases except locomotives and included in the charge for maintenance of locomotives in 1931 is $ 4871.32 for storage-batteries. In 1931 we also purchased a new Whitcomb electric mine locomotive and Edison battery at a cost of $ 1650.71. There was an unusual amount of rail bonding done during the past year.

O - PUMPING MACHINERY:

This account shows an increase of $ 719.50 over last year and the increased cost is due to the fire that we had underground in the main pump station on May 24th. The fire which started in the end thrust bearing on the centrifugal pump did very little damage, but the switchboard, motor leads and control apparatus was old and obsolete and for sometime the Mechanical Department had been considering the idea of rehabilitating the entire switchboard. The fire brought this to a head and the increased cost is due to modernizing the equipment in the pumphouse.

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8. COST OF OPERATING: (Continued)

b. Detailed Cost Comparison: (Continued)

P - HOISTING:

Detailed statements for hoisting expense for the past two years follow:-

| | 1931 | 1930 |
|---|---|---|
| Engineers | 3967.39 | 5402.02 |
| Other Labor | 387.67 | 600.40 |
| Total Labor | 4355.06 | 6002.42 |
| Oil, Waste and Packing | 93.23 | 53.44 |
| Tools & Miscellaneous Supplies | 58.88 | 123.89 |
| Electric Light | 120.82 | 120.00 |
| Electric Power | 10380.00 | 14478.30 |
| Heating Expense | 905.28 | 578.55 |
| Total Supplies | 11558.21 | 15354.18 |
| Total Operating Expense | 15913.27 | 21356.60 |

The unit cost for the two years is exactly the same and the decrease in total cost is a little more than the decrease in production.

Q - STOCKING ORE:

This account does not show much of a decrease because of the large amount of ore stocked even during the shipping season in the past year. The cost of moving the top-tram plant that is used to handle the lump ore car was also charged to this account during 1931. Because of the small amount of ore shipped from the stockpile grounds, more than the usual amount of stocking trestles had to be erected during the past year.

U - HOISTING EQUIPMENT:

In 1930 we charged out three new hoisting ropes, but no new ropes were put on in 1931. We did install, however, a new steel 8' bicycle sheave, track limit switches in both shafts and made minor repairs to the hoisting equipment.

X - DOCKS, TRESTLES & POCKETS:

This account shows an increase of $ 2099.19 because of the expense necessary to provide additional stocking grounds for both the lump and crushed ore. The grading and planking of these new stockpile areas cost $ 727.84 for labor and $ 1850.19 for supplies, making a total cost of $ 2578.03.

Y - MINE BUILDINGS:

Repairs to buildings were kept down to a minimum because of the depression and the following table shows the detailed cost for the past two years.

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YEAR 1931.

8. COST OF OPERATING: (Continued)

b. Detailed Cost Comparison: (Continued)

Y - MINE BUILDINGS: "

| | 1931 | 1930 |
|---|---|---|
| Office | 137.78 | |
| Warehouse | 11.25 | 100.77 |
| Shops | 121.33 | 557.22 |
| Shaft Houses | 66.39 | 166.11 |
| Engine House | 440.87 | 1799.52 |
| Dry House | 455.38 | 614.53 |
| Coal Dock & Trestle | 108.57 | 343.19 |
| Miscellaneous | 132.57 | 204.38 |
| Fire Protection | 26.13 | |
| Total | 1500.27 | 3785.72 |

There are decreases in every item for 1931 with the exception of some minor repairs to the oil heating plant in the office. The expense in the engine house was incurred by putting on the new fire-proof rope slides and repairs at the dry consisted of three items, viz., repairing the brick wall on the east side, putting in a new concrete sump for the hot well pump in the boiler room and putting on an addition to the dry on the east side for storing tools for the timbermen, scraper foreman and pipeman.

Z1 - INSURANCE, Z2, ETC.

These accounts under the heading "General Mine Expenses" are all distributive accounts and the majority of the charges come from either the Cleveland office or Ishpeming office.

9. EXPLORATIONS AND FUTURE EXPLORATIONS:

a. Diamond Drilling:

Four diamond drill holes were drilled during the year.

Hole No. 419, ninth level "A" shaft, drilled southeast towards the foot of the Southeast Vein cut 22 feet of high grade ore and was bottomed in the foot at 438 feet.

Hole No. 420, tenth level "A" shaft, drilled in the hanging of the Bancroft Vein to a depth of 300 feet went through 4 feet of high grade ore and 19 feet of second class ore.

Hole No. 421, tenth level "A" shaft, discovered 198 feet of high grade ore. This hole cut the largest footage of ore ever found in the Cliffs Shaft Mine.

Hole No. 422, fifteenth level "A" shaft, drilled north to intersect the Bancroft Vein cut two narrow stringers of ore that may be the bottom of the vein discovered on the tenth level.

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10. TAXES:

Taxes paid by the Cliffs Shaft Mine for the past two years follow:-

| | 1931 | | 1930 | |
|---|---|---|---|---|
| | Valuation | Taxes | Valuation | Taxes |
| Realty | 3,000,000 | 119,656.20 | 3,085,000 | 120,196.23 |
| Personal | 775,000 | 30,911.20 | 550,000 | 21,428.83 |
| Lot 2, Section 3 | 225,000 | 8,974.22 | 90,000 | 3,506.54 |
| Lot 174, Nelson Addition | 100 | 3.99 | 100 | 3.90 |
| South 35.91 Ft. of Lot 179 | 50 | 1.99 | 50 | 1.95 |
| Total | 4,000,150 | 159,547.60 | 3,725,150 | 145,137.45 |
| Collection Fees | | 1,595.48 | | 1,451.37 |
| Total Cliffs Shaft | | 161,143.08 | | 146,588.82 |
| Taxes per Ton Produced | | .553 | | .359 |
| Taxes per Ton Shipped | | 1.428 | | .533 |

Taxes levied by City of Ishpeming for the past three years follow:-

| | 1931 | 1930 | 1929 |
|---|---|---|---|
| State Tax | 46,570.45 | 47,494.76 | 48,603.56 |
| County Tax | 95,544.29 | 99,351.40 | 85,896.38 |
| County Road Tax | 29,295.41 | 34,871.38 | 36,811.32 |
| Highway Fund Tax | 60,000.00 | 60,000.00 | 55,000.00 |
| Library Fund Tax | 11,000.00 | 12,000.00 | 12,000.00 |
| Fire Fund Tax | 11,500.00 | 12,000.00 | 10,000.00 |
| School Tax | 165,000.00 | 145,000.00 | 145,000.00 |
| One Mill Tax | 12,626.18 | 12,690.99 | 12,755.76 |
| Sewer Fund Tax | 2,000.00 | 2,000.00 | 4,000.00 |
| Cemetery Fund Tax | 3,500.00 | 4,000.00 | 4,000.00 |
| City Tax | 64,000.00 | 65,000.00 | 65,000.00 |
| Rejected Tax | 64.42 | 48.51 | 34.68 |
| Water Fund Tax | 2,500.00 | | |
| Total Tax | 503,600.75 | 494,457.04 | 479,101.70 |

It will be noted that there are decreases in nearly every item for 1931 except the School Tax, which was raised $ 20,000.00 and the Water Fund Tax of $ 2500.00. The economy program of the County Board of Supervisors did reduce the taxes of the City $ 10,300.00.

11. ACCIDENTS AND PERSONAL INJURY:

The accident record at the Cliffs Shaft Mine was marred by a fatal accident, in which Jacob Pihlaja was killed by a premature blast. The accident was not preventable, as the place had been inspected by the Mine Superintendent, Safety Inspector, County Mine Inspector, Captain, Mine Foreman and Shift Boss previous to the accident.

A table showing the accidents for the past four years follows:-

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11. ACCIDENTS AND PERSONAL INJURY: (Continued)

| | 1931 | 1930 | 1929 | 1928 |
|---|---|---|---|---|
| No Lost Time Accidents | 30 | 61 | 62 | 45 |
| Compensable Accidents | 2 | 3 | 17 | 20 |
| Lost Time, but no Compensation Paid | 0 | 1 | 8 | 9 |

The following records are credited to the Cliffs Shaft property:-

| Year | Compensable Accidents | "A" SHAFT Tons Produced | Man Shifts Worked |
|---|---|---|---|
| 1930 | 2 | 267,901 | 54,562 |
| 1931 | 1 | 175,054 | 39,907 |
| | | "B" SHAFT | |
| 1930 | 1 | 175,794 | 39,508 |
| 1931 | 1 | 116,003 | 28,907 |

"B" Shaft operated from March 22nd, 1929 to May 25th, 1931 or a total of 795 days without an accident.

"A" Shaft operated from April 13th, 1930 to July 7th, 1931 or 451 days without an accident.

13. NEW EQUIPMENT:

Drill Machines:

Three new CP6 Drifters, ten Cleveland D9 Drifters, ten N75 Ingersoll-Rand Drifters and six R39 Jackhammers were added to the underground drill equipment in 1931.

Locomotives:

One new Whitcomb electric mine locomotive complete with Edison storage-battery was purchased to handle rock in "B" shaft.

One new 48 Cell MVA-15 Plate Ironclad-Exide Battery for General Electric locomotive and one new 126 A4 Cells Edison Battery for Goodman locomotive were purchased in 1931.

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14. MAINTENANCE AND REPAIRS:

Details regarding repairs to equipment at the mine have already appeared in this report.

Maintenance on houses was kept at a minimum, as an inspection of the following table shows:-

| | 1931 | 1930 |
|---|---|---|
| Cliffs Shaft Rented Buildings | 862.86 | 5729.10 |
| Angeline " " | 911.27 | 3157.29 |
| Second Addition " " | 637.66 | 1221.87 |
| Smith Purchase | 166.14 | 301.94 |
| Hyde Purchase No. 1 | 6.12 | 276.37 |
| Nelson Purchase | 119.61 | 482.58 |
| Outhwaite Purchase | 443.42 | 181.56 |
| Nebraska Purchase | 284.85 | 117.68 |
| Salisbury Rented Buildings | 582.67 | 144.19 |
| Total | 4014.60 | 11612.58 |

The above does not include the dwellings occupied by the Manager, General Superintendent and Chief Mechanical Engineer.

15. POWER:

Following is a comparison of the cost for electric current for 1930 and 1931:-

| | 1931 | | | 1930 | | |
|---|---|---|---|---|---|---|
| | K.W.H. | COST | PER TON | K.W.H. | COST | PER TON |
| Tramming | 201,600 | 3024.00 | .010 | 240,400 | 3606.00 | .009 |
| Pumping | 1,229,120 | 18436.80 | .063 | 1,601,404 | 24021.06 | .059 |
| Hoisting | 700,053 | 10500.82 | .036 | 973,220 | 14598.30 | .036 |
| Stocking Ore | 39,900 | 598.50 | .002 | 48,430 | 726.45 | .002 |
| Screening-Crushing | 60,710 | 910.65 | .003 | 71,336 | 1070.04 | .003 |
| Dry House | 13,942 | 209.12 | .001 | 14,360 | 215.40 | .000 |
| General Surface | 15,602 | 234.04 | .001 | 16,548 | 248.23 | .000 |
| Mine Office | 3,476 | 52.14 | .000 | 2,612 | 39.18 | .000 |
| Shops | 20,264 | 303.94 | .001 | 25,365 | 380.46 | .001 |
| Compressors | 1,338,291 | 20074.36 | .069 | 2,015,378 | 30230.67 | .074 |
| Electric Haulage | 229,360 | 3440.40 | .012 | 177,560 | 2663.40 | .007 |
| Dry Heating Plant | 8,054 | 120.81 | .001 | 8,000 | 120.00 | .000 |
| Total | 3,860,372 | 57905.58 | .199 | 5,194,613 | 77919.19 | .191 |
| COST PER | | | | | | |
| 1000 Gallons Water Pumped | | | .053 | | | .053 |
| 1000 Cu. Ft. Air Compressed | | | .034 | | | .033 |
| Ton Ore Stocked | | | .003 | | | .003 |
| Ton Ore and Rock Hoisted | | | .003 | | | .003 |
| Ton Ore and Rock Trammed | | | .002 | | | .001 |

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17. CONDITION OF PREMISES:

The houses in all the locations need painting. It has been ten years since the last job of painting was done and if they are not painted very soon, we are going to have heavy repair bills later on.

Roofs are in good shape and the interiors are kept in good condition.

18. NATIONALITY OF EMPLOYEES:

| | American Born | Foreign Born | Total |
|---|---|---|---|
| English | 56 | 16 | 72 |
| Swedish | 31 | 30 | 61 |
| Finnish | 38 | 97 | 135 |
| Italian | | 11 | 11 |
| German | 2 | 1 | 3 |
| French | 20 | 7 | 27 |
| Irish | 8 | 3 | 11 |
| Norwegian | 11 | 4 | 15 |
| Scotch | 1 | 1 | 2 |
| Total | 167 | 170 | 337 |

# MORRIS-LLOYD MINE

## ANNUAL REPORT

## YEAR 1931

### 1. GENERAL

Production for 1931 shows a large decrease, because of curtailment. The average daily hoist, however, shows a large increase. The tons per man per day, despite restricted production, shows an increase with consequent lower labor cost per ton of ore.

Ore reserves again were increased, because of development work started in 1930. The increase is unavoidable because it was imperative that a new level be opened up both in the Morris Shaft and Section 6 territories, and in each case we found the ore bodies much larger in extent than on the upper levels. From now on for a number of years the probabilities are that the developed tonnage will decrease each year until it becomes necessary to open up new territory.

There are areas in the Morris Shaft that are becoming quite warm and it is only a question of time before it will be necessary to install a large fan and put the whole mine under pressure as is being done in the Negaunee District.

### 2. PRODUCTION, SHIPMENTS & STOCKPILE BALANCES

#### a. Production by Grades

Production for 1931 was as follows:

| Grade | Tons |
|---|---|
| Morris | 156,605 |
| Morris Manganese | 7,332 |
| Morrisville | 39,868 |
| Lloyd | 15,907 |
| Lloyddale | 125,990 |
| Lloyd Silica | 3,456 |
| Total | 349,158 |

Production by grades for previous years follows:

| Year | Morris | Manganese | Silica | Lloyd | Lloyddale | Total |
|---|---|---|---|---|---|---|
| 1925 | 100,568 | | 59,945 | 105,316 | | 265,829 |
| 1926 | 110,863 | 3,436 | 53,088 | 49,678 | 73,097 | 290,162 |
| 1927 | 173,118 | 1,357 | 33,871 | 58,251 | 60,217 | 326,814 |
| 1928 | 134,455 | 33,347 | 49,754 | 32,161 | 106,447 | 356,164 |
| 1929 | 196,072 | 11,310 | 55,275 | 59,560 | 113,213 | 435,430 |
| 1930 | 197,768 | 15,124 | 60,403 | 52,502 | 139,574 | 465,371 |
| 1931 | 156,605 | 7,332 | 43,324 | 15,907 | 125,990 | 349,158 |

#### b. Shipments

Shipments tooka big slump in 1931, which is very evident from the table that follows:

| Grades | Pocket | Stockpile | Total | Total Last Year |
|---|---|---|---|---|
| Morris | 30,906 | | 30,906 | 176,068 |
| Morris Manganese | 7,332 | | 7,332 | 15,124 |
| Morrisville | 19,645 | 4,419 | 24,064 | 18,445 |
| Lloyd | 9,104 | | 9,104 | 28,809 |
| Lloyddale | 50,304 | 44,344 | 94,648 | 50,125 |
| Lloyd Silica | 3,253 | 3,308 | 6,561 | 11,220 |
| Total | 120,544 | 52,071 | 172,615 | 299,791 |
| Total Last Year | 194,698 | 105,093 | 299,791 | |
| Decrease | 74,154 | 53,022 | 127,176 | |

MORRIS-LLOYD MINE

ANNUAL REPORT

YEAR 1931

2. PRODUCTION, SHIPMENTS & STOCKPILE BALANCES (Continued)

b. Shipments: Continued:-

| | | |
|---|---|---|
| 1928 | 1-8Hr. Shift 5 days a week. | Jan. 1 to Dec. 31. |
| 1929 | 1-8 Hr.Shift 5 days a week. | Jan. 1 to Apr. 11. |
| 1929 | 1-8 Hr.Shift 6 Days a week. | Apr. 11 to Dec. 31. |
| 1930 | 1-8 Hr.Shift 6 Days a week. | Jan. 1 to July 16. |
| 1930 | 1-8HHr.Shift 5 Days a week. | July 16 to Dec. 31. |
| 1931 | 1-8 Hr.Shift 5 Days a week. | Jan. 1 to Apr. 30. |
| 1931 | 1-8 Hr. Shift 4 Days a week. | Apr. 30 to June 8th. |
| 1931 | 1-8 Hr.Shift 3 Days a week. | June 8 to Nov. 15. |
| 1931 | 1-8 Hr.Shift 2 Days a week. | Nov. 15 to Dec. 31. |

The tonnage shipped for the past 5 years follows:-

| Grades | 1927 | 1928 | 1929 | 1930 | 1931 |
|---|---|---|---|---|---|
| Morris | 148,118 | 193,093 | 242,740 | 176,068 | 30,906 |
| Morris Manganese | 86 | 22,849 | 21,966 | 15,124 | 7,332 |
| Morrisville | 15,790 | 2,391 | 72,236 | 18,445 | 24,064 |
| Lloyd | 58,615 | 66,440 | 179,191 | 28,809 | 9,104 |
| Lloyddale | 53,641 | 83,736 | 101,459 | 50,125 | 94,648 |
| Lloyd Silica | 21,038 | 24,675 | 20,642 | 11,220 | 6,561 |
| Total | 297,288 | 393,184 | 638,234 | 299,791 | 172,615 |

The destination of ores shipped is shown by following table:-

| | |
|---|---|
| L. S. & I. Dock | 151,379 Tons |
| Marquette Furnace | 8,094 Tons |
| Antrim Furnace | 3,167 Tons |
| Newberry Furnace | 3,837 Tons |
| Wells Furnace | 6,138 Tons |
| Total | 172,615 Tons |

c. Stockpile Balances:-

Ore in stock on December 31st, 1931 is as shown:-

| Grade | Tons |
|---|---|
| Morris | 268,055 |
| Morrisville | 62,151 |
| Lloyd | 35,749 |
| Lloyddale | 168,484 |
| Lloyd Silica | 12,645 |
| Total | 547,084 |

The comparison since 1925 follows:-

| Year | Morris | Mang. | Morrisville | Lloyd | Lloyddale | Lloyd Silica | Total |
|---|---|---|---|---|---|---|---|
| 1925 | 164,842 | | 15,759 | 154,733 | | 14,538 | 349,872 |
| 1926 | 194,820 | | 34,783 | 164,763 | 6,354 | 14,538 | 415,259 |
| 1927 | 219,820 | 1,271 | 31,786 | 164,399 | 12,930 | 14,579 | 444,785 |
| 1928 | 167,324 | 10,656 | 53,282 | 124,884 | 35,939 | 15,680 | 407,765 |
| 1929 | 120,656 | | 15,679 | 5,253 | 47,693 | 15,680 | 204,961 |
| 1930 | 142,356 | | 46,347 | 28,946 | 137,142 | 15,750 | 370,541 |
| 1931 | 268,055 | | 62,151 | 35,749 | 168,484 | 12,645 | 547,084 |

MORRIS LLOYD MINE

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2. PRODUCTION, SHIPMENTS & STOCKPILE BALANCES (Continued)

e. Production by Months

| Month | Days | Morris | Mang. | M. Ville | Lloyd | Lloyddale | Lloyd Silica | Total | Rock |
|---|---|---|---|---|---|---|---|---|---|
| January | 22 | 12,510 | 3,557 | 3,837 | 5,687 | 10,249 | | 35,840 | 1,446 |
| February | 20 | 14,964 | 2,141 | 4,472 | 3,508 | 9,208 | | 34,293 | 2,505 |
| March | 22 | 18,046 | 1,634 | 3,098 | 1,034 | 13,241 | | 37,053 | 3,309 |
| April | 22 | 18,245 | | 3,536 | 1,315 | 14,086 | | 37,182 | 3,057 |
| May | 16 | 12,877 | | 4,200 | 1,678 | 10,072 | | 28,827 | 1,677 |
| June | 14 | 12,623 | | 3,002 | 1,239 | 8,882 | | 25,746 | 1,236 |
| July | 14 | 11,447 | | 5,458 | 934 | 9,993 | | 27,832 | 1,197 |
| August | 13 | 12,532 | | 2,291 | | 10,760 | 53 | 25,636 | 320 |
| Sept. | 14 | 13,018 | | 3,787 | | 10,713 | 881 | 28,399 | 126 |
| October | 12 | 11,702 | | 3,412 | | 11,416 | 7 | 26,537 | 27 |
| Nov. | 11 | 9,825 | | 3,016 | 304 | 10,009 | | 23,154 | 57 |
| Dec. | 9 | 8,570 | | 2,326 | 553 | 7,210 | | 18,659 | 501 |
| Total | 189 | 156,359 | 7,332 | 42,435 | 16,252 | 125,839 | 941 | 349,158 | 15,458 |

f. Production from Chase Leases by Months:-

| Leases | No.9 | No. 24 | No.25 | No. 26 | No.27&28 | Total |
|---|---|---|---|---|---|---|
| Minimum Yearly Tonnage Required | 10,000 | 15,000 | 15,000 | 15,000 | 22,500 | 77,500 |
| January | 13,999 | 1,239 | | | | 15,238 |
| February | 16,745 | 414 | | | | 17,159 |
| March | 18,626 | | | | | 18,626 |
| April | 15,781 | | | | | 15,781 |
| May | 11,548 | | | | | 11,548 |
| June | 12,177 | | | | | 12,177 |
| July | 13,031 | | | | | 13,031 |
| August | 12,245 | | | | | 12,245 |
| September | 13,022 | | | | | 13,022 |
| October | 12,448 | | | | | 12,448 |
| November | 11663 | | | | | 11,663 |
| December | 9,556 | | | | | 9,556 |
| Total | 160,841 | 1,653 | | | | 162,494 |

Production from Leases by Years:

The table that follows shows production from leases since 1925:-

| Lease No. | 9 | 24 | 25 | 26 | 27 | 28 | Totals |
|---|---|---|---|---|---|---|---|
| Minimums Year | 10,000 | 15,000 | 15,000 | 15,000 | 15,000 | 7,560 | 77,500 |
| 1925 | 77,244 | 29,526 | 10,367 | 2,425 | | | 119,562 |
| 1926 | 53,102 | 47,876 | 14,604 | 303 | | | 115,885 |
| 1927 | 88,956 | 48,931 | 10,040 | 952 | | | 148,879 |
| 1928 | 119,115 | 29,090 | | | | | 148,205 |
| 1929 | 197,284 | 8,787 | | | | | 206,071 |
| 1930 | 206,188 | | | | | | 206,188 |
| 1931 | 160,841 | 1,653 | | | | | 162,494 |

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2. PRODUCTION, SHIPMENTS & STOCKPILE BALANCES (Continued)

f/ Total Royalties Accrued and production from Chase Leases:-

| No. of Lease | Accrued To Dec.31, 1931 | Mined To Dec. 31, 1931 | Balance |
|---|---|---|---|
| 9 | 232,283 | 1,571,695 | 1,339,412 |
| 24 | 331,088 | 233,588 | 97,500 |
| 25 | 331,088 | 51,246 | 279,842 |
| 26 | 321,713 | 9,043 | 312,670 |
| 27 | 299,213 | 178 | 299,035 |
| 28 | 149,607 | 0 | 149,607 |
| Totals | 1,664,992 | 1,865,750 | 200,758 |

Table showing balances due from combined leases, No.9 to 28 inclusive, since 1925:

| Year | Tons Accrued | Tons Mined | Balance |
|---|---|---|---|
| 1925 | 1,199,992 | 878,028 | 321,964 |
| 1926 | 1,277,492 | 993,913 | 283,579 |
| 1927 | 1,354,992 | 1,142,792 | 212,200 |
| 1928 | 1,432,492 | 1,290,997 | 141,495 |
| 1929 | 1,509,992 | 1,497,068 | 12,924 |
| 1930 | 1,587,492 | 1,703,256 | 115,764 |
| 1931 | 1,664,992 | 1,865,750 | 200,758 |

g. Ore Statement

| | Lloyd | Lloyd Dale | Lloyd Silica | Morris | Morris Ville | Hi Mang | Total | Total Last Year |
|---|---|---|---|---|---|---|---|---|
| On Hand Jan.1-31 | 28,946 | 137,142 | 15,750 | 142,356 | 46,347 | 0 | 370,541 | 204,961 |
| Output for Year | 16,252 | 125,839 | 941 | 156,359 | 42,435 | 7,332 | 349,158 | 465,371 |
| Transferred | 345 | 151 | 2,515 | 246 | 2,567 | | | |
| Total | 44,853 | 263,132 | 19,206 | 298,961 | 86,215 | 7,332 | 719,699 | 670,332 |
| Shipments | 9,104 | 94,648 | 6,561 | 30,906 | 24,064 | 7,332 | 172,615 | 299,791 |
| Balance in Stock | 35,749 | 168,484 | 12,645 | 268,055 | 62,151 | 0 | 547,084 | 370,541 |

h. Delays

We had only one delay during the entire year and that was due to changing hoisting ropes at the Lloyd Shaft. Hoisting was interrupted for one hour with a loss of 100 tons.

3. ANALYSIS

Average Mine Analysis on Output for 1931

| Grade | Iron | Phos. | Silica |
|---|---|---|---|
| | Lloyd Mine | | |
| Lloyd | 58.68 | .121 | 6.30 |
| Lloyddale | 58.34 | .164 | 7.38 |
| Lloyd Silica | 52.46 | .113 | 10.51 |
| | Morris Mine | | |
| Morris | 58.61 | .099 | 8.89 |
| Morrisville | 51.51 | .068 | 19.23 |
| Morris Hi-Manganese | 60.59 | .055 | 6.43 |

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3. Analysis

Analysis of Ore in Stock on December 31st, 1931

| Grade | Iron | Phos. | Sil. | Mang | Alum | Lime | Mag | Sil | Loss | Moisture |
|---|---|---|---|---|---|---|---|---|---|---|
| Morris | 52.43 | .067 | 7.23 | .45 | 2.28 | .73 | .26 | .012 | 2.57 | 10.75 |
| Lloyd | 52.29 | .112 | 5.64 | .22 | 2.03 | 1.05 | .34 | .011 | 4.08 | 11.25 |
| Lloyddale | 51.72 | .155 | 6.10 | .22 | 2.35 | 1.12 | .39 | .010 | 4.46 | 11.25 |
| M.Ville | 46.33 | .055 | 16.66 | .40 | 2.45 | .88 | .33 | .010 | 2.31 | 10.50 |
| Lloyd Sil. | 46.81 | .073 | 13.43 | .20 | 2.46 | .97 | .32 | .011 | 4.04 | 11.00 |

NOTE:- The ablve are all Natural Analysis.

Analysis of Ore Reserves on December 31st, 1931

| Grade | Iron | Phos. | Sil. | Mang | Alum | Lime | Mag | Sil | Loss | Moisture |
|---|---|---|---|---|---|---|---|---|---|---|
| Morris | 52.48 | .059 | 8.02 | 0.45 | 2.28 | .73 | .26 | .012 | 2.57 | 10.75 |
| Lloyd | 52.45 | .111 | 5.93 | 0.22 | 2.04 | 1.05 | .34 | .011 | 4.08 | 11.25 |
| Lloyddale | 51.56 | .166 | 6.28 | 0.22 | 2.35 | 1.12 | .39 | .010 | 4.46 | 11.25 |

NOTE:- The Above are all Natural Analysis

4. ORE RESERVES

ASsumption

12 Cu. Ft. Equals one ton.
10% deduction for rock.
10% deduction for loss in mining.

Ore in Sight as of November 30th, 1931.

MORRIS MINE

| | Morris Ore Tons |
|---|---|
| Above 7th Level, C.C.I.Co. Lands | 106,595 |
| Above 7th Level, Chase Lease No. 9 | 311,677 |
| Above 7th Level Chase Lease No. 24 | 18,011 |
| Above 7th Level, Chase Lease No. 25 | 22,937 |
| Above 7th Level, Chase Lease No. 26 | 9,687 |
| Above 8th Level, C.C.I.Co. Lands | 400,831 |
| Above 8th Level, Chase Lease No. 9 | 1,177,384 |
| Above 8th Level, Chase Lease No. 24 | 18,394 |
| Above 8th Level, Chase Lease No. 25 | 10,336 |
| Above 8th Level, Chase Lease No. 26 | 16,453 |
| Below 8th Level, C.C.I.Co. Lands | 57,290 |
| Below 8th Level, Chase Lease No. 9 | 306,282 |
| Total Ore in Morris Mine, | 2,455,877 |

LLOYD MINE

| | Lloyd Ore Tons |
|---|---|
| Above 3rd Level, | |
| Above 3rd Level, | 25,873 |
| Below 3rd Level, | 9,353 |
| Total Ore in Lloyd Mine | 35,226 |

LLOYD MINE EAST

| | Lloyd Ore | Lloyddale Ore | Total Tons |
|---|---|---|---|
| Above 3rd Level Main Sub | | 24,364 | 24,364 |
| Above 4th Main Sub | | 72,040 | 72,040 |
| Between 3rd Level and 4th Main Sub | | 89,971 | 89,971 |
| Above 4th Level | | 377,823 | 377,823 |
| Above 6th Level | 498,548 | 1,495,645 | 1,994,193 |
| Below 6th Level | 66,867 | 200,602 | 267,469 |
| Total Ore in Lloyd Mine East | 565,415 | 2,260,445 | 2,825,860 |

# MORRIS LLOYD MINE

## ANNUAL REPORT

## YEAR 1931

### 4. ESTIMATE OF ORE RESERVES

#### SUMMARY

| Mine | Morris Ore | Lloyd Ore | Lloyddale Ore | Total Ore |
|---|---|---|---|---|
| Morris Mine | 2,455,877 | | | 2,455,877 |
| Lloyd Mine | | 35,226 | | 35,226 |
| Lloyd Mine East | | 565,415 | 2,260,445 | 2,825,860 |
| Total Ore | 2,455,877 | 600,641 | 2,260,445 | 5,316,963 |

| | |
|---|---|
| Total Ore in Chase Lease No. 9 | 1,795,343 Tons |
| Total Ore in Chase Lease No. 24 | 36,405 Tons |
| Total Ore in Chase Lease No. 25 | 33,273 Tons |
| Total Ore in Chase Lease No. 26 | 26,140 Tons |
| Total Ore on All Leases | 1,891,161 |
| Total Ore on C.C.I.Cos. Lands | 3,425,802 |
| Total Ore in Morris-Lloyd Mine, | 5,316,963 |

Estimated Tonnage as reported to the State Tax Commission:-

All Non-Bessemer Grades

| | Morris Shaft | Lloyd and Lloyd East | Total |
|---|---|---|---|
| Morris | 2,447,307 | | 2,447,307 |
| Lloyd | | 600,088 | 600,088 |
| Lloyddale | | 2,253,235 | 2,253,235 |
| Total | 2,447,307 | 2,853,323 | 5,300,630 |

NOTE:- The above figures arrived at by deducting the December production from the Engineering Departments figures as of Nov. 30th, 1931.

The following table shows the ore reserves for the past 5 years and a summary of the new ore developed:

| | 1927 | 1928 | 1929 | 1930 | 1931 |
|---|---|---|---|---|---|
| Ore in Mine Nov.30. | 2,891,893 | 2,612,722 | 2,335,103 | 3,063,817 | 3,353,909 |
| Production | 315,909 | 356,437 | 429,934 | 461,837 | 367,853 |
| Balance | 2,575,984 | 2,256,285 | 1,905,169 | 2,601,980 | 2,986,056 |
| Ore in Mine Dec.1st. | 2,612,722 | 2,335,103 | 3,063,817 | 3,353,909 | 5,316,963 |
| New Ore Developed. | 36,738 | 78,818 | 1,158,648 | 751,929 | 2,330,907 |

### 5. LABOR AND WAGES

a. General

Because of the depression, the labor turnover was nil. As is usual in hard times, labor efficiency increased.

b. Comparative Statements:

Product, Shifts, and Hours:

| | 1931 | 1930 | Increase | Decrease |
|---|---|---|---|---|
| Product | 349,158 | 465,371 | | 116,213 |
| No. of Shifts and Hours | 1-8 Hr. | 1-8 Hr. | | |

MORRIS-LLOYD MINE

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## 5. LABOR AND WAGES

Average Number of men employed:

| Year | Surface | Underground | Total |
|---|---|---|---|
| 1921 | 46 | 203 | 249 |
| 1922 | 48 | 162 | 210 |
| 1923 | 44 | 156 | 200 |
| 1924 | 44 | 144 | 188 |
| 1925 | 45 | 145 | 190 |
| 1926 | 45 | 149 | 194 |
| 1927 | 50 | 178 | 228 |
| 1928 | 52 | 173 | 225 |
| 1929 | 55 | 176 | 231 |
| 1930 | 56½ | 192½ | 249 |
| 1931 | 55 | 210 | 265 |

| | 1931 | 1930 | Increase | Decrease |
|---|---|---|---|---|
| Surface | 55 | 56½ | | 1½ |
| Underground | 210 | 192½ | 17½ | |
| Total | 265 | 249 | 16 | |

Average Wages Per Day

| | 1931 | 1930 | Increase | Decrease |
|---|---|---|---|---|
| Surface | $4.42 | $4.35 | $0.07 | |
| Underground | 5.12 | 5.27 | | $0.15 |
| Total | 4.97 | 5.06 | | 0.09 |

| Year | Surface | Underground | Total |
|---|---|---|---|
| 1922 | $3.72 | $4.19 | $4.08 |
| 1923 | 4.12 | 4.65 | 4.53 |
| 1924 | 4.29 | 4.94 | 4.78 |
| 1925 | 4.34 | 5.02 | 4.86 |
| 1926 | 4.32 | 5.02 | 4.85 |
| 1927 | 4.33 | 5.14 | 4.94 |
| 1928 | 4.34 | 5.09 | 4.90 |
| 1929 | 4.35 | 5.08 | 4.90 |
| 1930 | 4.35 | 5.27 | 5.06 |
| 1931 | 4.42 | 5.12 | 4.97 |

Wages Per Month of 25 Days

| | 1931 | 1930 | Increase | Decrease |
|---|---|---|---|---|
| Surface | $110.50 | $108.75 | $1.75 | |
| Underground | 128.00 | 131.75 | | $3.75 |
| Total | 124.25 | 126.50 | | 2.25 |

Wages Per Month of 22 Days

| | | | | |
|---|---|---|---|---|
| Surface | 97.24 | 95.70 | 1.54 | |
| Underground | 112.64 | 115.94 | | 3.30 |
| Total | 109.34 | 111.32 | | 1.98 |

Wages Per Month of 17 Days

| | | | | |
|---|---|---|---|---|
| Surface | 75.14 | 73.95 | 1.19 | |
| Underground | 87.04 | 89.59 | | 2.55 |
| Total | 84.49 | 86.02 | | 1.53 |

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5. LABOR AND WAGES
(Continued)

Wages Per Month of 13 Days

| | 1931 | 1930 | Increase | Decrease |
|---|---|---|---|---|
| Surface | $57.46 | $56.55 | $0.91 | |
| Underground | 66.56 | 68.51 | | $1.95 |
| Total | 64.61 | 65.78 | | 1.17 |

Wages Per Month of 9 Days

| | | | | |
|---|---|---|---|---|
| Surface | 39.78 | 39.15 | 0.63 | |
| Underground | 46.08 | 47.43 | | 1.35 |
| Total | 44.73 | 45.54 | | 0.81 |

Product Per Man Per Day

| | 1931 | 1930 | Increase | Decrease |
|---|---|---|---|---|
| Surface | 30.19 | 27.65 | 2.54 | |
| Underground | 8.72 | 8.52 | 0.20 | |
| Total | 6.76 | 6.54 | 0.22 | |

| Year | Surface | Underground | Total |
|---|---|---|---|
| 1920 | 17.67 | 4.33 | 3.48 |
| 1921 | 18.78 | 4.22 | 3.44 |
| 1922 | 17.40 | 5.33 | 4.08 |
| 1923 | 18.47 | 5.58 | 4.28 |
| 1924 | 19.08 | 6.42 | 4.80 |
| 1925 | 20.45 | 6.85 | 5.13 |
| 1926 | 21.42 | 6.97 | 5.26 |
| 1927 | 20.93 | 6.61 | 5.02 |
| 1928 | 23.09 | 7.59 | 5.71 |
| 1929 | 25.53 | 8.22 | 6.22 |
| 1930 | 27.65 | 8.52 | 6.54 |
| 1931 | 30.19 | 8.72 | 6.76 |

It will be noted that 1931 shows the best record.

Labor Cost Per Ton

| | 1931 | 1930 | Increase | Decrease |
|---|---|---|---|---|
| Surface | .146 | .157 | | .011 |
| Underground | .588 | .619 | | .031 |
| Total | .734 | .776 | | .042 |

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YEAR 1931

5. LABOR AND WAGES
(Continued)

Labor Cost Per Ton

| Year | Surface | Underground | Total |
|---|---|---|---|
| 1920 | .307 | 1.482 | 1.791 |
| 1921 | .242 | 1.248 | 1.490 |
| 1922 | .214 | .786 | 1.000 |
| 1923 | .223 | .834 | 1.057 |
| 1924 | .225 | .770 | .995 |
| 1925 | .212 | .733 | .945 |
| 1926 | .201 | .721 | .922 |
| 1927 | .207 | .777 | .984 |
| 1928 | .188 | .671 | .859 |
| 1929 | .171 | .618 | .789 |
| 1930 | .157 | .619 | .776 |
| 1931 | .146 | .588 | .734 |

The Year 1931 shows the lowest labor cost per ton of Ore

| | 1931 | 1930 | Inc. | Dec. |
|---|---|---|---|---|
| Average product Stoping & Tramming. | 18.06 | 15.93 | 2.13 | |
| Average Wages Contract Miners. | 5.63 | 6.03 | | 0.40 |

Total Number of Days

| | 1931 | 1930 | Inc. | Dec. |
|---|---|---|---|---|
| Surface | 11,564$\frac{3}{4}$ | 16,833 | | 5,268$\frac{1}{4}$ |
| Underground | 40,049$\frac{3}{4}$ | 54,572$\frac{1}{4}$ | | 14,522$\frac{1}{2}$ |
| Total | 51,614$\frac{1}{2}$ | 71,405$\frac{1}{4}$ | | 19,790$\frac{3}{4}$ |

Amount for Labor

| | 1931 | 1930 | Increase | Decrease |
|---|---|---|---|---|
| Surface | $51,133.97 | $73,267.74 | | $22,133.77 |
| Underground | 205,272.48 | 287,801.84 | | 82,529.36 |
| Total | 256,406.45 | 361,069.58 | | 104,663.13 |

Proportion Surface to Underground Men

| | | | |
|---|---|---|---|
| 1924 | 1 | to | 3.27 |
| 1925 | 1 | to | 3.22 |
| 1926 | 1 | to | 3.31 |
| 1927 | 1 | to | 3.56 |
| 1928 | 1 | to | 3.33 |
| 1929 | 1 | to | 3.20 |
| 1930 | 1 | to | 3.41 |
| 1931 | 1 | to | 3.82 |

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6. SURFACE

a. Buildings

The Morris Mine shaft house was partially rebuilt below the landing floor. All "I" beams, channels, and angles that were badly corroded were replaced.

A new coal dock was built near the Morris Mine dry. An area 50 feet square was graded and covered with 2" Hemlock plank. Space for a chute and pocket was excavated under the stockpile loading track near by and coal dumped from hopper cars is scraped onto the planked area with a scraper hoist.

The roof on the North side of the Morris shaft dry was repaired.

7. UNDERGROUND

b. Development

Lloyd Mine East

The new drift driven East at the 6th level elevation, 400 feet below the present bottom or 4th level in the Section Six portion of the Mine, went through 200 feet of high grade ore in 1930. Very little was known as to the extent or shape of the ore body found in the drift, it was decided to drill three Diamond Drill Holes to determine the shape of the ore body. It was absolutely necessary to get an idea of the amount of ore between the 4th and 6th levels, because, considerable addittional development work would be necessary before the ore could be mined efficiently. As we had hoped, the 3 holes proved that between 2½ and 3 millions of tons of ore existed below the 4th level. As the 4th and 6th levels are 400 feet apart, two new levels will have to be opened up 133 feet apart and the Lloyd Shaft will have to be sunk 400 feet. As this work will involve the driving of 10,000 feet of ore and rock drifts and cross cuts, sinking the shaft 400 feet, cutting 3 shaft stations and putting up probably 8,000 or 9,000 feet of raises, it is obvious that the development of this ore body could not be delayed, because at the present rate of production the ore above the 4th level will be mined out in 3 years.

At the close of the year, we had just started to drive a cross cut from the 6th level footwall drift North to get under the Lloyd Shaft which will be raised and stripped.

MORRIS MINE

Seventh Level

Two new cross cuts were driven on Chase Lease No. 9, in the new ore body found by raising and cross cutting and further developed by Diamond Drill Hole No. 110. Four raises were also put up and exploring done on the 110 foot sub level. At the present little is known about this ore body except that it extends over 100 feet above the 7th level and down to the 8th level. In places it is 125 feet wide and at least 200 feet long.

Eighth Level

One new cross cut about 300 feet long was driven near the South central part of Chase Lease No. 9.

Three new raises were put up from the 7th to the 8th levels in the main ore body.

The main footwall drift was extended clear across Chase Lease No. 24 and breasted on the East side of Chase Lease No. 25, Diamond Drill Stations were cut at intervals of 200 feet along the south side of the drift and some of these stations cut ore. No Diamond Drilling was done, however, because, we did not want to develop too much tonnage in excess of our requirements. Conditions here are just opposite from the Section Six portion of the Mine, because, new tonnage can be developed quickly and made available for mining by raising from the new 8th level. No intermediate levels are required.

c. Stoping

There are 2 general systems of mining used at this property. Where the ore lenses are narrow and steep and the hanging and footwall are slate or

MORRIS-LLOYD MINE

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7. UNDERGROUND

C. Stoping (Continued)

MORRIS MINE

Jasper, the ore is mined by the sub level stoping method. Eight out of 31 contracts were stoping in 1931. The remaining 23 gangs are top slicing, the sub levels being 10 feet apart. Wire fencing and poles are used for lagging down and most of the stull timber used is cut in 9 foot lengths.

Morris Shaft

No. 21 Deposit

The portion of this deposit that lies below the 280 foot sub level was stoped from the 210 foot sub level. Exploring proved this ore lens petered out at the 150 foot elevation, so a transfer drift was driven from the main raise on the 150 foot sub level and at the end of the year most of the ore had been mined out down to the bottom of the deposit.

No. 61 Deposit

Several small pillars left in the upper portion of this deposit, between, the 6th level and the 250 foot sub level were mined out.

On the West end of the No. 61 deposit, contract No. 62 sliced on the 200, 190,180, and 170 foot sub levels. On the East side No. 33 stoped out the ore lying between the 250, and 300 foot sub levels, and then sliced on the 240 and 230 foot sub levels. All of the above ore was mined on Chase Lease No.9.

Deposit "A"

To the South of No. 61 deposit, we discovered late last year a new lens that gave promise of turning out a nice tonnage of high grade Morris Ore. This ore lens, however, proved very disappointing, because we found it full of horses of rock and finally mined only scattered portions of it.

MAIN DEPOSIT

Seventh Level

The main deposit was mined at varying elevations during the past year. Beginning at the top and going West, No. 63 sliced out the 190, 180, and 170 foot sub levels. This gang mined out only fee ore. Continuing West, No. 30 and 39 mining on the dividing line between the companies own fee and Chase Lease No. 9 sliced out the 150, 140, 130 and 120 foot sub levels.

Eighth Level

Four more contracts No. 32, 71, 90, and 92 mined out the central part of the main deposit between the 7th level and the 60 foot sub level.

In the South West corner of the main or No. 33 deposit, contract No.38 stoped up to the hanging from the 000 foot sub level.

LLOYD MINE EAST

All of the ore mined in the East end of the property was taken out of the main deposit. Because of the character of the hanging walls and the narrow width of many of the ore stringers or fingers it was possible to work 5 separate stopes in this section of the mine.

East End

Contracts No. 10 and 17 sliced on the 1,210 foot sub level and then stoped from the 1,200 foot elevation down to the 1,100 foot sub level.

Central Portion

Contracts No. 1 and No. 8 drove a new sub level transfer drift on the 990 foot elevation preparatory to opening up a new stope between the 1,000 foot sub level and the back of the new transfer drift.

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7. UNDERGROUND

LLOYD MINE EAST (Continued)

Central Portion

Between the 3rd and 4th levels, most of the gangs in the East end of the property mined their ore. Contracts No. 19, 102, and 103 stoped along the main foot wall, while No. 5, 17, 20, 46, and 100 sliced on the 830, 820, and 810 foot sub levels.

Contract No. 9 stoped along the foot on the South side between No. 102's old stope and the area being mined by No. 5, 17, Etc.

South West End

In the early part of the year No. 5, 7, and 8, and 100 also sliced out the 765 foot sub level which is the last sub above the main 4th level cross cut.

Contracts No. 3 and 46 also stoped the ore left between the 775 foot sub and the 910 foot sub level in the extreme South West corner of the level.

Fourth Level

In order to speed up the loading at the chutes all of the cross cuts, on the main 4th level were driven South into the footwall to enable us to spot more cars at the chutes.

Two new raises were also put up to the top of the ore from the 1st and 2nd cross cuts

The following table shows the increase in the tons per man secured from stoping operations for the year 1931, and also the comparison since 1920.

Stoping Tons Per Man

| Year | Tons Per Miner |
|---|---|
| 1920 | 9.27 |
| 1921 | 10.20 |
| 1922 | 13.82 |
| 1923 | 15.54 |
| 1924 | 15.67 |
| 1925 | 17.10 |
| 1926 | 17.33 |
| 1927 | 17.46 |
| 1928 | 20.26 |
| 1929 | 23.29 |
| 1930 | 23.75 |
| 1931 | 23.94 |

Although the efficiency curve has flattened out still there was an increase for 1931. It is interesting to note that the average ton per miner stoping for the period August to December 1931 was 26,52.

d. TIMBERING

During the past year we standardized on 9 foot legs and caps for sub level timber. The old supply of 16 foot stull timber of course had to be cut 8 feet long, but all new timber ordered specified 18 foot logs.

We used very little treated timber in 1931, because from observations at this property, the additional cost was not justified.

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7. UNDERGROUND

d. TIMBERING (Continued)

Statement showing timber used for year 1931.

| | Lineal Feet | Avg. Price Per Foot | Amount 1931 | Amount 1930 |
|---|---|---|---|---|
| 6" to 8" Timber | 102,976 | .042 | 4,337.58 | 3,896.47 |
| 8" to 10" Timber | 69,318 | .067 | 4,609,86 | 7,022.19 |
| 10" to 12" Timber | 33,626 | .089 | 2,985.10 | 3,552.40 |
| 12" to 14" Timber | 11,802 | .111 | 1,309.83 | 1,002.38 |
| Treated Timber | | | | 1,468.73 |
| Total Timber 1931 | 217,722 | .061 | 13,242.37 | 16,942.17 |
| Total Timber 1930 | 248,170 | .068 | 16,942.17 | |
| | | Per 100 Ft. | | |
| 5' Lagging - 350 Cords | 297,500 | .763 | 2,271,52 | 5,133.24 |
| 7' Lagging | 382,975 | .703 | 2,690.60 | 7.96 |
| 8' Lagging | 289,370 | .797 | 2,307.50 | 4,088.34 |
| Total Lagging | 969,845 | .749 | 7,269.62 | 9,229.54 |
| 3½' Poles | 295,041 | 1.49 | 4,400.45 | 6,852.70 |
| Wire Fencing - 1585 Rods | 26,153 | 4.54 | 1,186.49 | 889.88 |
| Total Poles and Fencing | 321,194 | 1.74 | 5,586.94 | 7,742.58 |
| Total Poles, Lagging and Fencing 1931 | 1,291,039 | .99 | 12,856.56 | 16,972.12 |
| Total Poles, Lagging and Fencing 1930 | 1,665,618 | 1.02 | 16,972.12 | |
| Product - Tons | | | 349,158 | 465,371 |
| Feet of Timber Per Ton of Ore | | | .623 | .533 |
| Feet of Lagging Per Ton of Ore | | | 2.777 | 2.522 |
| Feet of Lagging Per Foot of Timber | | | 4.454 | 4.731 |
| Cost Per Ton for Timber | | | .0378 | .0364 |
| Cost Per Ton for Lagging | | | .0209 | .0199 |
| Cost Per Ton for Poles and Fencing | | | .0160 | .0166 |
| Cost Per Ton for All Timber | | | .0747 | .0729 |
| Equivalent of Stull Timber to Board Measure | | | 351,489 | 400,357 |
| Feet of Board Measure Per Ton of Ore | | | 1.006 | .860 |

| Cost of Timber, Lagging, Poles, and Fencing | Year | Amount | Cost Per Ton |
|---|---|---|---|
| | 1931 | 26,098.93 | .0747 |
| | 1930 | 33,914.29 | .0729 |
| | 1929 | 29,885.03 | .0687 |
| | 1928 | 27,690.94 | .0777 |
| | 1927 | 27,993.33 | .0857 |
| | 1926 | 21,787.65 | .0752 |
| | 1925 | 17,701.50 | .0666 |
| | 1924 | 16,664.69 | .0676 |
| | 1923 | 15,207.16 | .0585 |

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7. UNDERGROUND

e. DRIFTING AND RAISING

We did not do the usual amount of rock drifting in 1931, because we did not want to get the Morris Mine 8th level development work too far ahead of our needs. As mentioned previously in this report, we did the amount of drifting required in the East end of the property on Section Six, but the bulk of this work was done in 1930.

Following are the footages for 1931.

| | |
|---|---|
| Development in Rock | 1,688 Ft. |
| Development in Ore, Drifting | 2,789 Ft. |
| Development in Ore, Raising | 2,941 Ft. |
| Total | 7,418 Ft. |

f. STATEMENT OF EXPLOSIVES USED:

| | QUANTITY | AVERAGE PRICE | AMOUNT 1931 | AMOUNT 1930 |
|---|---|---|---|---|
| Breaking Ore | | | | |
| Gelamite Powder 1x & 2x | 161,096 | 12.75 | 20,539.80 | |
| Total Powder | 161,096 | 12.75 | 20,539.80 | 27,062.47 |
| Fuse - Feet | 517,204 | 5.93 | 3,065.27 | 3,462.55 |
| Blasting Caps | 85,414 | 11.60 | 990.78 | 1,234.69 |
| Tamping Bags | 24,925 | 1.95 | 48.60 | 47.75 |
| Cap Sealing Compound | 2 | .60 | 1.20 | 4.20 |
| Fuse Lighters | 6,470 | 9.00 | 58.44 | |
| Hand Crimpers | 1 | | .42 | |
| Total Fuse, Caps, Etc., | | | 4,164.71 | 4,749.19 |
| Total Explosives | | | 24,704.51 | 31,811.66 |
| Product - Tons | | | 349,158 | 465,371 |
| Pounds Powder Per Ton of Ore | | | .461 | .431 |
| Cost Per Ton for Powder | | | .059 | .058 |
| Cost Per Ton for Fuse, Caps, Etc., | | | .012 | .010 |
| Cost Per Ton for All Explosives | | | .071 | .068 |
| Development in Rock | | | | |
| Gelamite Powder 1x | 29,000 | 12.75 | 3,697.51 | |
| Total Powder | 29,000 | 12.75 | 3,697.51 | 7,354.99 |
| Fuse | 56,830 | 5.99 | 340.61 | 584.49 |
| Blasting Caps | 7,968 | 11.60 | 92.34 | 168.23 |
| Tamping Bags | 75 | 1.95 | .14 | .60 |
| Fuse Lighters | 530 | 9.00 | 5.02 | |
| Total Fuse, Caps, Etc., | | | 438.11 | 753.32 |
| Total Explosives | | | 4,135.62 | 8,108.31 |

MORRIS-LLOYD MINE

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7. UNDERGROUND

f. STATEMENT OF EXPLOSIVES USED BREAKING ORE & ROCK DEVELOPING 1931: (Continued)

| | AMOUNT 1931 | AMOUNT 1930 |
|---|---|---|
| Feet Rock Drifting | 1,735 | 3,061 |
| Cost Per Foot for Powder | 2.131 | 2.403 |
| Cost Per Foot for Fuse, Caps, Etc., | .253 | .246 |
| Cost Per Foot for All Explosives | 2.384 | 2.649 |
| Grand Total Explosives used in Mine | 28,840.13 | 39,919.97 |
| Cost Per Ton for All Explosives Used | .083 | .086 |
| Average Price Per Pound for Powder | .1275 | .1249 |

It will be noted that the cost per ton for breaking ore in 1931 was almost identical with the previous year. It is difficult to make comparisons year by year, because the percentage of ore broken on the sub levels or in the stopes varies. Ore won by the sub level stoping method requires less powder to break it than that mined by the top slicing method.

The following table shows the record for the past 5 years.

| Year | Pounds of Powder Per Ton of Ore | Cost Per Ton For Powder |
|---|---|---|
| 1927 | .500 | .074 |
| 1928 | .473 | .072 |
| 1929 | .451 | .064 |
| 1930 | .431 | .058 |
| 1931 | .461 | .059 |

The explosive statement, however does show that the cost per foot for explosives used in rock drifting decreased in 1931

8. COST OF OPERATING

It is not possible to compare the cost of production, as we have done previously, because, the cost sheets for the years 1930 and 1931, include such items as Ishpeming Hospital operating loss, Central Office Expense, Mechanical Department Expense, in the cost of production, whereas, these items previous to 1930 were only included in the total cost at the Mine.

The total cost at Mine for the past 5 years follows:-

| Cost at Mine Year | Production | Daily Product | Total Cost Per Ton |
|---|---|---|---|
| 1931 | 349,158 | 1,847 | 1.873 |
| 1930 | 465,371 | 1,659 | 1.872 |
| 1929 | 435,430 | 1,501 | 1.881 |
| 1928 | 356,164 | 1,362 | 2.029 |
| 1927 | 326,814 | 1,224 | 2.269 |

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8. COST OF OPERATING

Comparative Mining Costs

| | 1931 | 1930 | Increase | Decrease |
|---|---|---|---|---|
| Product | 349,158 | 465,371 | | 116,213 |
| Underground Costs | 1.044 | 1.122 | | .078 |
| Surface Costs | .152 | .169 | | .017 |
| General Mine Expenses | .242 | .195 | .047 | |
| Cost of Production | 1.438 | 1.486 | | .048 |
| Depreciation | .203 | .221 | | .018 |
| Taxes | .217 | .140 | .077 | |
| Loading and Shipping | .015 | .025 | | .010 |
| Total Cost at Mine | 1.873 | 1.872 | .001 | |
| No. of Days Operating | 189 | 280½ | | 91½ |
| No. Shifts and Hours | 1-8 Hr. | 1-8 Hr. | | |
| Average Daily Product | 1,847 | 1,659 | 188 | |

It will be noted that the total cost at the mine is identical within one mill for the years 1930 and 1931, but that the cost of production shows a decrease of nearly .05¢ per ton for 1931. The fixed charges, particularily taxes, increased the unit cost for 1931. If production had been at the rate of 5 days a week for 1931, taxes would have shown an increase of only 1¢ per ton.

DETAILED COST COMPARISON

| Account | Year 1931 Amount | Per Ton | Year 1930 Amount | Per Ton | Increase Amount | Per Ton | Decrease Amount | Per Ton |
|---|---|---|---|---|---|---|---|---|
| a. Exploring in Mine | 5,900.13 | .017 | 6,777.58 | .015 | | .002 | 877.45 | |
| b. Dev. In Rock | 15,089.13 | .043 | 33,887.28 | .073 | | | 18,798.15 | .030 |
| c. Dev. In Ore | 31,824.42 | .091 | 32,267.77 | .069 | | .022 | 443.35 | |
| d. Stoping | 128,858.84 | .369 | 189,611.40 | .407 | | | 60,752.56 | .038 |
| e. Timbering | 68,171.64 | .195 | 89,292.17 | .192 | | .003 | 21,120.53 | |
| f. Tramming | 36,189.49 | .104 | 53,563.81 | .115 | | | 17,374.32 | .011 |
| g. Ventilation | 1,368.59 | .004 | 283.41 | .001 | 1,085.18 | .003 | | |
| h. Pumping | 18,151.52 | .052 | 17,771.50 | .038 | 380.02 | .014 | | |
| i. Compressors And Air Pipes | 29,002.67 | .083 | 47,184.45 | .101 | | | 18,181.78 | .018 |

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8. COST OF OPERATING

DETAILED COST COMPARISON (Continued)

| Account | Year 1931 Amount | Per Ton | Year 1930 Amount | Per Ton | Increase Amount | Per Ton | Decrease Amount | Per Ton |
|---|---|---|---|---|---|---|---|---|
| j. Undg. Supt. | 12,730.15 | .036 | 16,742.39 | .036 | | | 4,012.24 | |
| k. Comp. And Power Drills | 395.62 | .001 | 4,615.07 | .010 | | | 4,219.45 | .009 |
| l. Elec.Tram Equipm. | 15,970.71 | .047 | 27,850.03 | .060 | | | 11,879.32 | .013 |
| m. Pumping Machinery | 735.61 | .002 | 2,155.51 | ..005 | | | 1,419.90 | .003 |
| n. Hoisting | 20,074.13 | .057 | 27,312.64 | .059 | | | 7,238.51 | .002 |
| o. Stocking Ore | 9,803.18 | .028 | 13,097.35 | .028 | | | 3,294.17 | |
| p. Screening & Crushing | 1,310.33 | .004 | 3,522.30 | .007 | | | 2,211.97 | .003 |
| q. Dry House | 6,398.13 | .018 | 10,164.64 | .022 | | | 3,766.51 | .004 |
| r. Gen.Surface Expense | 4,898.53 | .014 | 6,433.74 | .014 | | | 1,535.21 | |
| s. Hoisting Equipment | 3,430.82 | .010 | 4,750.58 | .010 | | | 1,319.76 | |
| t. Shaft | 1,160.17 | .003 | 4,494.93 | .010 | | | 3,334.76 | .007 |
| u. Top Tram Equipment | 1,580.52 | .005 | 1,997.33 | .004 | | .001 | 416.81 | |
| v. Docks Trestles & Pockets | 1,219.17 | .003 | 510.16 | .001 | 709.01 | .002 | | |
| w. Mine Buildings | 3,380.00 | .010 | 6,194.06 | .014 | | | 2,814.06 | .004 |

MORRIS-LLOYD MINE

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YEAR 1931

8. COST OF OPERATING

DETAILED COST COMPARISON (Continued)

| | Account | Year 1931 Amount | Per Ton | Year 1930 Amount | Per Ton | Increase Amount | Per Ton | Decrease Amount | Per Ton |
|---|---|---|---|---|---|---|---|---|---|
| x. | Gen. Mine Accounts | | | | | | | | |
| X1. | Insurance | 137.64 | . | 110.98 | . | 26.66 | | | |
| X2. | Mining Engineering | 3,921.50 | .011 | 3,979.11 | .009 | | .002 | 57.61 | |
| X3. | Mechanical& Electric ial Engineering | 1,976.27 | .006 | 1,400.40 | .003 | 575.87 | .003 | | |
| X4. | Analysis & Grading | 9,691.18 | .028 | 12,810.41 | .028 | | | 3,119.23 | |
| X5. | Personal Injury | 15,079.36 | .043 | 17,045.45 | .036 | | .007 | 1,966.09 | |
| X6. | Safety Depart. | 1,396.25 | .004 | 1,420.02 | .003 | | .001 | 23.77 | |
| X7. | Tel. & Safety Devices | 2,840.64 | .008 | 3,389.38 | .007 | | .001 | 548.74 | |
| X8. | Local & General Welfare | 8,885.26 | .026 | 9,348.51 | .020 | | .006 | 463.25 | |
| X9. | Special Expense | 13,653.54 | .039 | 11,889.86 | .026 | 1,763.68 | .013 | | |
| X10. | Ishpeming Office | 15,058.60 | .043 | 16,205.45 | .035 | | .008 | 1,146.85 | |
| X11. | Mine Office | 11,751.23 | .034 | 13,335.58 | .028 | | .006 | 1,584.35 | |

With the exception of half a dozenitems, the total amount of money spent under each account on the cost sheet shows a decrease, which is accounted for by a decrease of almost 100 days in the operating schedule. The decreased tonnage also causes an increase in the unit cost for items a, c, e, g, etc., in the cases where the increases or decreases are not entirely due to the curtailment schedule detailed reasons follow:-

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8. COST OF OPERATING

DETAILED COST COMPARISON

b. Development in Rock

The total amount expended in 1931 is less than half that for the previous year. The footage for 1930 was 3,251 and for 1931 only 1,735 ft. The unit cost however, was $8.70 per foot in 1931 compared with $10.42 in 1930. As all but 62 feet was done before the 10% cut in wages, the lower unit cost is accounted for by other reasons.

Following are the detailed costs:

| | 1930 | | 1931 | |
|---|---|---|---|---|
| | Amount | Cost Per Foot | Amount | Cost Per Foot |
| Labor | 20,488.85 | $6.31 | 8,749.81 | $5.04 |
| Supplies | 13,398.43 | 4.11 | 6,339.32 | 3.65 |
| Total | 33,887.28 | 10.42 | 15,089.13 | 8.70 |
| Machinery Supplies | 2,334.31 | 0.72 | 1,316.86 | 0.76 |
| Iron & Steel | 532.92 | 0.16 | 235.35 | .14 |
| Explosives | 8,108.31 | 2.49 | 4,135.62 | 2.38 |
| Miscellaneous | 2,422.89 | .74 | 651.49 | .38 |
| Total Supplies | 13,398.43 | 4.11 | 6,339.32 | 3.66 |

You will note a large decrease in the labor cost per foot, not due to the cut in wages, because, that was effective after most all the rock drifting was finished, but because, we eliminated all the overtime drilling and blasting necessary to get 2 cuts a shift. It is the same old story to the effect that when a job is crowded and men have to work longer than the regular shift, the unit cost always is high. Another factor in the decreased unit cost was the discarding of the scraper slides, by using the Butler Loader. The Butler also requires one less man to trim the cars per shift than the Armstrong "Shuveloader".

To put it another way, the difference in cost is mostly due to using a Mechanical Shovel instead of a scraper slide.

The explosive cost shows a little decrease and we used much less general supplies such as wire rope, oil and grease, hose, etc. Cost for wire rope for operating scraper Slides was high in 1930.

c. Development in Ore

The costs for the 2 years are almost identical, because of the large amount of main level drifting in ore in 1931, whereas, in 1930 most of our main level work was in rock. In 1930 a larger amount of sub level development in ore was done. The footage of ore drifts and raises for the 2 years was viz:-

1930 - 5,719 Feet.
1931 - 5,730 Feet.

d. Stoping

Detailed costs for the 2 years follows:-

| | 1931 | | 1930 | |
|---|---|---|---|---|
| | Amount | Cost Per Ton | Amount | Cost Per Ton |
| General Supplies | 3,918.38 | .011 | 6,032.78 | .013 |
| Iron and Steel | 1,029.22 | .003 | 1,764.27 | .004 |
| Oil And Grease | 281.67 | .001 | 359.72 | .001 |
| Machinery Supplies | 8,073.18 | .023 | 9,376.60 | .021 |
| Explosives | 18264.95 | .052 | 25,448.42 | .055 |
| Lumber and Timber | 69.26 | | 164.56 | |
| Electric Power | 1,465.80 | .004 | 1,931.65 | .004 |

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8. COST OF OPERATING

DETAILED COST COMPARISON (Continued)

d. Stoping (Continued)

| | 1931 | | 1930 | |
|---|---|---|---|---|
| | Amount | Cost Per Ton | Amount | Cost Per Ton |
| Sundries | 197.86 | .001 | 221.35 | |
| S. L. & T. | 1,275.29 | .004 | 1,335.42 | .003 |
| Scrapers | 2,132.98 | .006 | 6,874.14 | .014 |
| Total Supplies | 36,690.59 | .105 | 53,528.88 | .115 |
| Pay Roll Labor | 86,385.71 | .247 | 127,734.66 | .274 |
| S. L. & T. | 5,782.54 | .017 | 8,347.86 | .018 |
| Total Labor | 92,168.25 | .264 | 136,082.52 | .292 |
| Grand Total | 128,858.84 | .369 | 189,611.40 | .407 |

The biggest saving was in the item of Machinery Supplies, which includes scrapers, due to more careful supervision of the drills and scraper hoists and because of salvaging a great many repair parts. There is also a larger cut in the labor cost than is accounted for by the 10% cut on November 15 due to better efficiency underground. The combined saving is almost $.04 per ton.

f. Tramming

The decrease in unit cost per ton is due to less track cleaning on account of the new rocker dump cars put into service in the latter part of 1930. Under normal operating (5 days a week) the track cleaning costs used to run $700 to $750 per month. The average for 1931 is approximately $350 per month. Although the product hauled decreased 25% the track cleaning expense was cut 50%.

g. Ventilation

This is one of the few accounts that shows an increased cost for 1931. There were 2 areas in the Morris Mine where the air was bad and we purchased 2, #2½ Anaconda Sirocco fans with 5 H.P. Motors and enough 6" and 12" Ventube to ventilate 6 contracts Nos. 32, 33, 62, 71, 90 and 92. We also installed an old Buffalo Blower on top the 2nd outlet raise that runs from the 6th to the 4th levels, which added to the natural circulation on the 6th and 7th levels.

New raises were also put up at different points connecting the dead ends of the main levels.

The only way to really improve the air conditions is to install a large fan of 100,000 or 150,000 Cu. Ft. capacity on surface at Section Six shaft and to put up a large raise from the East End of the 6th level to the bottom of the present Lloyd East workings, whereby, fresh air can be shunted through all the Morris Mine workings.

h. Pumping

Pumping costs show an increase for 2 reasons. We are pumping more water from a greater depth and when the mine is idle more pumpmen helpers are employed in order to have at least 2 men in the mine when they are on duty

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8. COST OF OPERATING

DETAILED COST COMPARISON (Continued)

h. Pumping (Continued)

Detailed expense for 2 years follows:-

| | 1931 | 1930 |
|---|---|---|
| Pumpmen Labor | 4,409.69 | 4,915.65 |
| Other Labor | 108.08 | 180.05 |
| Total Labor | 4,517.77 | 5,095.70 |
| Oil, Waste, Etc., | 400.97 | 395.84 |
| Tools, & Miscellaneous Supplies | 73.58 | 93.91 |
| Proportion of Air Charge | 600.00 | 600.00 |
| Electric Power | 12,559.20 | 11,586.05 |
| Total Supplies | 13,633.75 | 12,675.80 |
| Total Operating Expense | 18,151.52 | 17,771.50 |
| Gallons Water Pumped | 205,406,448 | 224,981,368 |
| Cost Per 1,000 Gallons | .088 | .079 |

Although as mentioned above we are employing more pumpmens helpers in 1931, labor for pumpmen shows a decrease from 1930, because in 1930 we ran into a heavy flow of water on both the 6th level Lloyd East and on the 8th level Morris in the main level development drifts and pumpmen were required to work in relays of 3 - 8 Hours shifts. During the summer of 1931, conditions became normal again and we went back to the old routine of having the pumpmen work only 2 - 8 hour shifts.

The following table shows the water pumped for the past few years:-

| Year | Gallons | Gallons Per Minute. |
|---|---|---|
| 1931 | 205,406,448 | 390 |
| 1930 | 224,981,368 | 428 |
| 1929 | 236,102,174 | 449 |
| 1928 | 227,752,993 | 433 |
| 1927 | 223,631,596 | 425 |
| 1926 | 205,247,760 | 390 |
| 1925 | 172,168,518 | 328 |

k. Compressors and Air Pipes

The decrease in the unit cost per ton indicates a saving not only in the use of compressed air, but also a smaller consumption of air pipes and fittings.

The detailed cost of operating the compressors for the past 2 years follows:-

| | 1931 | 1930 |
|---|---|---|
| Engineers Labor | 3,646.05 | 4,080.83 |
| Tolls & Miscellaneous Supplies | 65.39 | 15.57 |
| Water | 395.83 | 392.29 |
| Electric Power | 22,443.12 | 36,369.27 |
| Oil, Waste, Etc., | 124.51 | 254.18 |
| Heating Expense | 401.44 | 481.56 |
| Total Supplies | 23,430.29 | 37,512.87 |
| Total Operating Expense | 27,076.34 | 41,593.70 |
| Cost Per 1,000 Cu. Ft. | .041 | .039 |
| Cost Per Ton | .079 | .089 |
| Air Pipes and Installation | 1,926.33 | 5,590.75 |
| Total Compressors and Air Pipes | 29,002.67 | 47,184.45 |

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8. COST OF OPERATING

DETAILED COST COMPARISON

i. Compressors and Air Pipes (Continued)

The cost per ton shows a reduction of .01 due to more economical use of compressed air and the large decrease in air pipes and fittings is partially due to salvaging old pipes, but mostly, because, of the decreased footage of the main level rock drifts. These drifts are always equipped with 4" pipe and fittings.

k. Compressors and Power Drills

Costs for 1931 show a large decrease, in fact the cost for the past year was nominal, because, only 2 second hand R.B. 12 Auger Drills were purchased from the Archibald Mine.

l. Electric Tram Equipment

The cost of maintaining the electric haulage plant for the past 2 years follows:-

| | 1931 | 1930 |
|---|---|---|
| Generator | 46.02 | 99.91 |
| Locomotives | 1,536.88 | 3,373.81 |
| Wiring | 1,162.55 | 2,588.41 |
| Main Line Tracks | 5,507.19 | 9,906.04 |
| Main Line Cars | 7,646.60 | 11,845.34 |
| Spotting Engines | 71.47 | 36.52 |
| Total | 15,970.71 | 27.850.03 |

The decrease in cost is not proportionate with the decrease in product, because, we made every effort to keep the maintenance costs at a minimum, without letting the equipment run down. The costs under locomotives in 1930, also included a second hand locomotive from the Crosby Mine billed at $500.00. Under Main Line Cars were included 16 new 4 ton Rocker Dump Cars, Costing $485.00 each in 1930 and only 12 in 1931.

m. Pumping Machinery

The expense for 1931 was low. Only two repair jobs were required, one a suction valve chamber for the 6" x 12" Aldrich Pump on the 8th level and the other the changing of the 5½" poles back to 6½" size on the No. 2 Prescott Pump on the 4th level.

n. Hoisting

Following are detailed costs of operating the hoisting plants for the last 2 years.

| | 1931 | 1930 |
|---|---|---|
| Engineers Labor | 5,685.43 | 8,447.13 |
| Other Labor | 10.35 | 13.53 |
| Total Labor | 5,695.78 | 8,460.66 |
| Oil, Waste, Etc., | 131.30 | 183.13 |
| Tools, Etc., | 91.70 | 131.82 |
| Electric Power | 13,641.45 | 17,565.60 |
| Heating Expense | 513.90 | 971.43 |
| Total Supplies | 14,378.35 | 18,851.98 |
| Total Operating Exp. | 20,074.13 | 27,312.64 |

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8. OPERATING COST

DETAILED COST COMPARISON

n. Hoisting (Continued)

The decrease in cost is almost exactly in the same ratio as the decrease in tonnage hoisted and as a result the unit cost shows little change for the two years.

p. Screening & Crushing at Mine

The total cost for 1931 is only about 1/3 that of the previous year. Repairs to the 2 crushing plants were kept low. The only purchases were a bevel gear, and a dust collar and a pinion. Operating expenses decreased from $2,785.95 to $903.96, because, of large decrease in tonnage crushed.

q. Dry House

The 1931 cost shows a decrease not only in thetotal amount, but also in the unit cost. The supplies for the year including coal totalled $2999.74 compared with $4,661.85 for 1930. Labor cost less, because, the section Six Shaft Dry was closed in the fall of 1930 and has not been open since.

t. Shaft

Cost during 1930 was higher than the average, because, of extensive repairs to the Morris Shaft, between the 6th and 7th levels and also due to installing 5,000 lineal feet of new runners. Expenses for 1931 were below normal.

v. Docks, Trestles and Pockets

The expense for 1931 was incurred in two major projects; the new coal dock at the dry, and grading the Morris Ore stockpile area on the North side of the North pile.

The new coal dock eliminates hauling all the coal for the central heating plant, and also permits us to receive coal in ore cars instead of shoveling it out of gondolas.

w. Mine Buildings

A detailed cost of maintaining the buildings for 2 years follows:-

| | 1931 | 1930 |
|---|---|---|
| Office | 21.40 | 128.89 |
| Shops | 61.53 | 141.57 |
| Shaft House | 1,773.68 | 4,2 49.21 |
| Engine House | 996.54 | 337.51 |
| Dry House | 292.56 | 756.74 |
| Miscellaneous | 53.73 | 580.14 |
| Total | 3,199.44 | 6,194.06 |

The heavy decrease is in the shaft house expense. In 1930 the Lloyd Shaft House was entire rebuilt below the landing floor and a few rapairs made on the Morris Shaft House. In 1931 repairs to the Morris Shaft House were continued.

In 1931 the rope slides covering the rope openings in the front walls of both Engine Houses were rebuilt and made of fire proof material. The change was made as a result of 2 fires, one at the Republic Mine, and one at the Cliffs Shaft Mine, in each case the rope breaking and allowing the skip to drop to the bottom of the shaft.

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8. COST OF OPERATING

DETAILED COST COMPARISON

X3. Mechanical and Electricial Engineering

Cost for 1931 increased, because, of more supervision on the part of the Mechanical Department.

X9. Special Expense

This is a distributive account and all the charges made come from the Ishpeming or Cleveland Offices.

9. EXPLORATIONS

Four drill holes were drilled with the results as shown:-

Hole No. 106, Lloyd Mine East, 6th level. Cut through slate footwall, then 70 feet of ore and then Dike.

Hole No. 107, Lloyd Mine East, 6th level. This hole found the same ore as No. 106. Ore was high grade, and 70 feet thick. Holes No. 106, and 107, are spaced 400 feet apart.

Hole No. 108, 250 feet to the west of No. 107 found 156 feet of high grade ore.

Hole No. 109 drilled on the 110 foot sub level on Chase Lease No. 9 in the Morris Shaft area discovered no ore.

10. TAXES

The following tables show tax data for both Ely and Ishpeming Townships. All of the Morris Mine workings are in Ely Township. The Lloyd and Lloyd Mine East, are in Ishpeming Township.

| Lloyd Mine and Section Six | 1931 | | 1930 | |
|---|---|---|---|---|
| | Valuation | Taxes | Valuation | Taxes |
| Realty | 701,450 | 21,534.19 | 516,450 | 19,124.74 |
| Personal | 590,000 | 18,112.73 | 485,000 | 17,960.93 |
| Total | 1,291,450 | 39,646.92 | 1,001,450 | 37,085.67 |
| Collection Fees | | 396.47 | | 370.86 |
| Total Lloyd | | 40,043.39 | | 37,456.53 |
| **Morris Mine** | | | | |
| Realty | 625,600 | 20,491.52 | 480,600 | 17,305.94 |
| Personal | 455,000 | 14,903.53 | 275,000 | 9,902.44 |
| Total | 1,080,600 | 35,395.05 | 755,600 | 27,208.38 |
| Collection Fees | | 353.95 | | 272.09 |
| Total Taxes | | 35,749.00 | | 27,480.47 |
| Grand Total | 2,372,050 | 75,792.39 | 1,757,050 | 64,937.00 |
| Product Tons | 349,158 | | 465,371 | |
| Taxes Per Ton of Production | .2171 | | .1395 | |
| Shipment Tons | 172,615 | | 299,791 | |
| Taxes Per Ton Shipped | .4391 | | .2166 | |

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10. TAXES

Taxes Raised in Ely Township

| Tax | 1931 | 1930 | 1929 |
|---|---|---|---|
| State | 10,010.47 | 7,997.50 | 6,523.15 |
| County | 20,537.56 | 16,729.49 | 11,528.27 |
| County Road | 6,297.15 | 5,871.89 | 4,940.50 |
| Highway Improvement | 8,600.00 | 8,000.00 | 8,000.00 |
| Road Repair | 12,000.00 | 7,000.00 | 7,000.00 |
| School | 13,000.00 | 13,000.00 | 13,000.00 |
| One Mill | 2,714.44 | 2,136.68 | 1,711.77 |
| Bridge | 3,500.00 | 3,000.00 | 3,000.00 |
| School Building | 8,000.00 | 8,000.00 | 8,000.00 |
| Township Contingent | 4,000.00 | 4,000.00 | 4,000.00 |
| Rejected Tax | 62.00 | 40.38 | 39.95 |
| Special Tax | | 1,200.00 | |
| Total Tax | 88,721.62 | 76,975.94 | 67,743.64 |

The total in this township increased, because, the increase in assessed valuation of $425,000.00 increased the proportion of the state, county and county road taxes. Furthermore, the local township board also increased their township road taxes.

Taxes Raised in Ishpeming Township

| Tax | 1931 | 1930 | 1929 |
|---|---|---|---|
| State | 6,248.24 | 5,276.77 | 4,999.05 |
| County | 12,818.94 | 11,038.16 | 8,834.75 |
| County Road | 3,930.50 | 3,874.29 | 3,786.18 |
| Township Contingent | 3,000.00 | 3,000.00 | 2,500.00 |
| Highway Improvement | 1,000.00 | 2,000.00 | 3,000.00 |
| Road Repair | 7,000.00 | 6,500.00 | 5,000.00 |
| School Tax | 16,306.23 | 18,590.18 | 18,687.62 |
| One Mill Tax | 1,693.77 | 1,409.82 | 1,312.38 |
| Rejected Tax | 4.96 | 17.64 | 163.31 |
| Bridge Tax | | 500.00 | |
| Total Tax | 52,002.64 | 52,206.86 | 48,283.29 |

11. ACCIDENTS AND PERSONAL INJURY

The accident record for the past 2 years follows:-

| | 1931 | 1930 |
|---|---|---|
| Fatal Accidents | 1 | 1 |
| Compensible Accidents | 4 | 8 |

The fatal accident caused the death of Joseph Bussone, who waited too long after spitting the holes in a blast, and was caught when the powder exploded. The accident was preventable.

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13. EQUIPMENT

Because of the depression very little new equipment was purchased. In fact we only purchased one 5 H.P. Blower Fan, and 2 Sullivan Electric Hoists for the year.

14. MAINTENANCE AND REPAIRS

Detailed descriptions already appear in this report, previous to this heading, relative to all repairs made at the mine.

15. POWER

The following table shows the power used by the hoists, compressors, pumps, etc., for the past 2 years:-

| | 1931 | | 1930 | |
|---|---|---|---|---|
| | K.W.H. | Amount | K.W.H. | Amount |
| Pumping | 837,280 | 12,559.20 | 772,403 | 11,586.05 |
| Compressors | 1,496,208 | 22,443.12 | 2,424,618 | 36,369.27 |
| Electric Haulage | 222,595 | 3,338.92 | 306,484 | 4,507.25 |
| Hoisting | 909,430 | 13,641.45 | 1,171,040 | 17,565.60 |
| Miscellaneous | 207,325 | 3,109.88 | 176,989 | 2,654.84 |
| Grand Total | 3,672,838 | 55,092.57 | 4,845,534 | 72,683.01 |

16. WATER SUPPLY

The only expense in connection with the water supply in 1931 was the taking up of the old 4" wood pipe on school street in the location and replacing it with iron pipe.

One new fire Hydrant was installed on the 6" main, between the Club House and the school so as to have ample water supply in case we had to call on the Ishpeming City pumper.

17. CONDITION OF PREMISES

Maintenance costs were kept at a minimum in the location. Repairs to rented buildings which includes store, Superintendent's house, 128 dwellings, sheds, etc., was $3,123.58 or a cost of less than $25.00 per unit.

18. NATIONALITY REPORT

| | |
|---|---|
| Finnish | 106 |
| French | 60 |
| English | 40 |
| Italian | 38 |
| Scandanivians | 35 |
| Irish | 1 |
| Greek | 1 |
| Austrian | 1 |
| Total | 282 |

# TILDEN MINE
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# YEAR 1931

## 1. GENERAL

The operation of the Tilden Mine during the season 1931, was very intermittant. Loading was started as early as April 17th, and we shipped 15,525 tons for the month, the largest tonnage produced in April from the Tilden Pit. For the balance of the season the pit was operated only about half time, the pit being idle during the entire month of August.

Early in September we received an order for a cargo of Low Phosphorous Silica ore, and arrangements were immediately made to open up the East deposit. The No. 31 shovel was moved from the West Pit, the blast hole drilling completed for the first blast, and the track extended to the point of loading. Although we were apprehensive as to how the phosphorous content would run, we realized the desired tonnage of 10,569 tons, and within the guarantee of .015 phosphorous.

The seasons requirements, which were only about half of that for 1930, were secured on October 21st. The pit was cleaned up of tools and equipment, and the entire crew laid off for the balance of the year on October 23rd.

## 2. PRODUCTION SHIPMENTS & INVENTORIES

### a. Production by Grades

| | |
|---|---|
| Tilden Silica | 126,441 Tons |
| Tilden Low Phosphorous Silica | 10,569 |
| Total | 137,010 |

This production compares with 287,043 tons produced during 1930, a decrease of 150,033 tons.

### b. Shipments

The shipments from the Tilden Mine for 1931 were the same as the production figures, as all the ore mined was forwarded to Lake Erie and Lake Michigan ports.

### c. Stockpile Inventories

There is no ore in stock. We estimate approximately 30,000 tons of broken ore in the West Pit from the blast made November 1st, 1930.

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## 2. PRODUCTION SHIPMENTS & INVENTORIES

### e. Product by Months

| Months. | Days Operated | Average Daily Tonnage | Total Tons |
|---|---|---|---|
| April | 12 | 1,294 | 15,525 |
| May | 12 | 2,258 | 27,100 |
| June | 13 | 2,370 | 30,814 |
| July | 17 | 2,118 | 36,017 |
| August | 0 | 0 | 0 |
| September | 19 | 915 | 17,396 |
| October | 10 | 1,004 | 10,043 |
| November | | | 53 |
| Total, | 83 | 1,651 | 137,010 |

The ore loaded during the season 1931 was from that broken by the blast of November 1st, 1930. The first cut was cast to the north by No. 31 shovel, so as to make room for a loading track which was laid as the shovel worked west. While loading was started on April 17th, the run-around was not completed until April 26th, when both shovels loaded ore, which explains the small daily tonnage for that month. During May, June and July we secured a good tonnage. The small tonnage for September and October is due to operations in the East Pit, where only one shovel was operated and a large tonnage of rock was cast or taken to the rock dump.

### f. Ore Statement

| | Year Tons | Last Year Tons | Increase | Decrease |
|---|---|---|---|---|
| On hand Jan.1st,1931 | None | None | | |
| Output for Year | 137,010 | 287,043 | | 150,033 |
| Total | 137,010 | 287,043 | | 150,033 |
| Shipments | 137,010 | 287,043 | | 150,033 |
| Bal. on Hand, | None | None | | |

1931 1-9 Hour Shift 5 days per week Jan.1st to Feb. 16th, 1931
1-9 Hour Shift 4 days per week Feb. 16th to June 1st, 1931
1-9 Hour Shift 3 days per week June 1st to Oct. 23rd, 1931

1930 1-9 Hour shift 6 days per week April 23rd to July 21st,1930
1-9-Hour Shift 5 days per week July 21st to Oct. 1st, 1930.

### g. Delays

The mechanical and electrical delays during the past season were not serious, only one causing a shutdown for a day. Our explanation for this is that all of the equipment was in first class shape at the beginning of the season, and the ore well broken, so as to reduce the heavy service on all the equipment. The total delays for the season amounted to 10 hours, with a loss of 2,550 tons, compared with 31¼ hours delay and a loss of 5,810 tons during 1930. A detail of the delays follows:

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2. PRODUCTION SHIPMENTS & INVENTORIES (Continued)

g. Delays

| Month | Duration | Tons Lost | Cause |
|---|---|---|---|
| June | 1½ Hours | 200 | Current going off of line and plugging crusher. |
| July | 8½ Hours | 2,350 | Lightning coming in on line and burning out coils in the motors of the two small crushers. |
| Total 1931 | 10 Hours | 2,550 Tons | |
| Total 1930 | 30½ Hours | 5,810 Tons | |
| Total 1929 | 494¼ Hours | 65,025 Tons | |

h. Delays from lack of Current

There were no delays during the season of 1931 from the lack of current.

3. ANALYSIS

a. Average Mine Analysis on Output

| Grade | Iron | Phos. | Silica |
|---|---|---|---|
| Tilden Silica | 39.72 | .047 | 40.36 |
| Tilden Low Phosphorous | 37.82 | .013 | 41.96 |

b. Average Analysis on Straight Cargoes.

| Grade | Mine | | | Lake Erie | |
|---|---|---|---|---|---|
| | Iron | Phos. | Sil. | Iron | Moisture |
| Tilden Silica | 39.79 | .047 | 40.40 | 40.40 | 2.00 |
| Tilden Low Phosphorous | 37.63 | .014 | 41.94 | 37.34 | 2.30 |

4. ESTIMATE OF ORE RESERVES

a. Developed Ore
1. West Pit

Assumption: 14 cu. ft. equals one ton.
10% deduction for rock.
Grade: Tilden Silica.

| | |
|---|---|
| Ore in sight Jan. 1st, 1931, Upper Bench | 831,188 Tons |
| Ore mined during 1931 from Upper Bench | 123,413 Tons |
| Ore in sight Jan. 1st, 1932, Upper Bench | 707,775 Tons |
| Ore in sight Jan. 1st, 1932, Lower Bench | 1,870,000 Tons |
| Total developed ore Jan. 1st, 1932, West Pit | 2,577,775 Tons |

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4. ESTIMATE OF ORE RESERVES

a. Developed Ore

2. East Pit

Assumption: 14 cu. ft. equals one ton.
10% deduction for rock.
Grade: Tilden Silica.
All tonnage above 1500 ft. elevation
(Track grade from Crushing Plant)

| | |
|---|---|
| Ore in sight Jan. 1st, 1931 | |
| Silicious grade above .015 phos. | 2,057,143 Tons |
| Ore mined during 1931, | |
| Grading above .015 Phos. | 3,028 Tons |
| Ore in sight Jan. 1st, 1932, | |
| Grading above .015 Phos. . . . . | 2,054,115 Tons |
| Ore in sight Jan. 1st, 1931, | |
| Grading below .015 Phos. | 3,477,857 Tons |
| Ore mined during 1931, | |
| Grading below .015 Phos | 10,569 Tons |
| Ore in sight Jan. 1st, 1932 | |
| Grading below .015 Phos. . . . . | 3,467,288 Tons |
| Total Developed ore Jan. 1st, 1932, East Pit, | 5,521,403 Tons |

3. East and West Pits

| | |
|---|---|
| Total Developed ore Jan. 1st, 1932, West Pit, | 2,577,775 Tons |
| Total Developed ore Jan. 1st, 1932, East Pit, | 5,521,403 Tons |
| Grand Total Developed ore January 1st, 1932, East and West Pits, ..... | 8,099,178 Tons |

b. Prospective Ore

In addition to the developed ore, there is probably a very large tonnage to the North and East of the area developed by the East Pit drilling, while at the West Pit there is probably a large tonnage of ore to the North and West, which due to the heavy overburden in the swamp to the north, and the existance of a dike of considerable size between the present pit and the ore to the northwest, it would be too expensive to secure.

c. Estimated Analysis

| | Iron | Phos. | Sil. | Mang. | Alum. | Lime | Mag. | Sul. | Ign. | Moist |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. West Pit. | | | | | | | | | | |
| Dried | 42.50 | .045 | 35.10 | .120 | .67 | .48 | .31 | .014 | .90 | |
| Natural | 41.44 | .045 | 34.22 | .118 | .65 | .47 | .30 | .013 | .88 | 2.50 |
| 2. East Pit. | | | | | | | | | | |
| Dried | 38.20 | .017 | 42.12 | .120 | .67 | .48 | .31 | .014 | .90 | |
| Natural | 37.24 | .017 | 41.07 | .118 | .65 | .47 | .30 | .013 | .88 | 2.50 |

Of the tonnage estimated for the East Pit, the low phosphorous tonnage will average under .015, and the silicious grade material .022.

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4. ESTIMATE OF ORE RESERVES

f. Estimate of Production

The following is the estimate of tonnage and analysis of ore to be produced from the Tilden Mine during 1932. These figures are very conservative and can be increased materially.

| Grade | Tonnage | Iron | Phos. | Sil. | Sul. | Moist. | Iron Natural |
|---|---|---|---|---|---|---|---|
| Tilden Silica | 300,000 | 39.00 | .040 | 41.00 | .009 | 2.50 | 38.02 |
| Tilden Low Phos. | 50,000 | 37.50 | .015 | 43.00 | .009 | 2.50 | 36.52 |

5. LABOR & WAGES.

A. Comments

1. Labor

We maintained a crew of about 37 men, employing them part time until October 22nd. During the first three and a half months of the year the crew was employed on churn drilling and repairs to equipment. From April 17th to October 22nd, they were employed intermittantly loading ore. Our crew is made up almost entirely of skilled labor, working at any job available. The locomotive engineers and firemen work as helpers to the churn drill runners during the winter, and then the churn drill men work in the crushing plant and pit while loading.

The mine has been idle since October 22nd. The Captain and Mechanic doing what repair work they could do on the churn drills and locomotives. They have also spent some time salvaging equipment.

2. New Construction

All new construction work was done by our regular mine labor and charged to the proper operating or E and A account.

b. Comparative Statement of Wages and Product.

| | 1931 | 1930 | Increase | Decrease |
|---|---|---|---|---|
| Product | 137,010 | 287,043 | | 150,033 |
| No. of Shifts and Hours, | 1-9 | 1-9 | | |
| Average Number Men Working | 32 | 24 | 8 | |
| Average Wages per day | 5.02 | 4.70 | .32 | |
| Tons Per Man Per Day | 40.56 | 53.79 | | 13.23 |
| Labor Cost Per Ton Labor Stmt. | .124 | .087 | .037 | |
| Labor Cost Per Ton Cost Sheet | .144 | .100 | .044 | |
| Total Number of Days | 3378¼ | 5336 | | 1957¾ |
| Amount Paid for Labor Per Labor Statement | 16,957.55 | 25,118.68 | | 8,161.13 |
| Amount Paid for Labor Per Cost Sheet | 19,724.64 | 28,849.65 | | 9,125.01 |

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## 6. SURFACE

### a. Buildings, Repairs

The carpenters and shopmen built a partition between the shop and compressor room in order to keep it clean. The inside of both the shop and compressor room were covered with metal lath and gunited. The walls and ceiling of the office were covered with plaster board and painted. This treatment of the office keeps out dirt that previously came through the cracks in the partition, and deadens the noise from the operation of the drill sharpener and compressor.

## 7. OPEN PIT OPERATIONS

### a. Stripping

There was no stripping done at the West Pit during 1931. At the East Pit we continued to remove the top rough material with a 50 horsepower scraper hoist during the months of January, February and March. By this time a considerable area was uncovered ready for washing the remaining dirt to clean the ore if any of this Low Phosphorous grade was desired. The cost of stripping with the scraper was about half that of washing. This operation was carried on by two men.

The yardage stripped by months from the East Pit was as follows:

| Month | Yards Washing | Yards Scraper | Total Yards |
|---|---|---|---|
| January | 0 | 1,120 | 1,120 |
| February | 0 | 1,160 | 1,160 |
| March | 0 | 1,000 | 1,000 |
| Total, | 0 | 3,280 | 3,280 |

Statement of Stripping Cost West Pit

| | 1927-28 | 1929 | 1930 | Total |
|---|---|---|---|---|
| Cubic Yds. Stripped | 23,000 | 13,365 | 2,860 | 39,225 |
| Holmes Mine | $ 53.53 | | | 53.53 |
| General Storehouse | 68.60 | | | 68.60 |
| Cliffs Shaft Mine | 510.85 | | | 510.85 |
| Ogden Mine | 1,197.40 | | | 1,197.40 |
| Labor at Mine | 7,455.47 | 5,600.20 | 1,167.15 | 14,682.82 |
| Supplies at Mine | 6,535.24 | 4,222.15 | 1,136.43 | 11,893.82 |
| TOTAL, | $15,821.09 | $9,822.35 | 2,763.58 | 28,407.02 |
| Cost Per Cu.Yd. | .688 | .742 | .966 | .724 |

NOTE: No stripping done at West Pit 1931.

STATEMENT OF STRIPPING COST, East Pit.

| | 1931 | 1930 | TOTAL |
|---|---|---|---|
| Cubic Yards Stripped | 3,280 | 6,930 | 10,210 |
| Labor at Mine | $782.82 | $3,047.87 | $3,830.69 |
| Supplies at Mine | 374.94 | 2,084.38 | 2,459.32 |
| Total | $1,157.76 | 5,132.25 | 6,290.01 |
| Cost Per Cubic Yard | .353 | .740 | .616 |

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7. OPEN PIT OPERATIONS (Continued)

e. Open Pit Operations

Loading operations for the season 1931 were started on April 17th, and continued until the morning of the 28th, loading 15,525 tons. This is the largest tonnage produced in the month of April from the Tilden Pit, and compares with 9,145 tons in 1929, and 7,569 tons in 1930. The ore loaded was blasted on November 1st, 1930. The No. 31 shovel started at the East end of the West Pit and cast the ore to the north. As the No. 31 shovel advanced, the track crew laid the loading track for the No. 29 shovel which followed with a second cut. It took the No. 31 shovel a week to reach the West end of the pit, when it turned around and started to load ore as it worked eastward.

The pit was idle from April 30th until May 13th when operations were resumed for a period. This first loading cut was completed on May 21st, and moving of the track for a second cut started. It took until May 26th before the trains could make a complete run-around and loading was normal.

At the West end of the pit we encountered some dike rock, which was cast behind the shovel. When the quantity of the material became too large to handle in this manner, the shovel was cut out and moved into the good ore ahead. A dike averaging from 3 to 20 feet thick, for a distance of 150 feet, was drilled and blasted in a field blast last November. Whenever we were stopped from loading ore, waiting for boats, the shovel was turned back to load and waste this rock on the rock dump at the West end of the pit.

Loading operations were intermittant during June and July, and the pit was idle during the entire month of August.

A boat due early in September required a few hundred tons more ore than was in dock and cars, and the pit was operated two days. Just at this time word was received from Cleveland that they were about to close negotiations for a cargo of low phosphorous ore from the Tilden. As we had a very small tonnage of Tilden Silica still to go forward, and we would secure a substantial tonnage of this grade from the East Pit, loading was again stopped.

We received word on September 5th to start immediately to open the East Pit for the mining of about 10,000 tons low phosphorous ore, and on Sunday the 6th, we started to move the No. 31 shovel from the West Pit to the East Pit. This shovel was moved down the slope at the West end of the pit to the L. S. & I. railroad tracks, thence east along the track to a point just south of the coal loading pocket. From this point the shovel cut its own grade up to the track leading from the Crushing Plant to the new East Pit. It took four days to move the shovel from the West Pit to a point near the East Pit. Should it ever be necessary to move this shovel back to the West Pit, now that it has cut its own grade, the time can be cut down materially.

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7. OPEN PIT OPERATIONS (Continued)

e. Open Pit Operations (Continued)

The blast at the East Pit was made about noon of September 10th, and actual loading started on the 11th. On account of the track arrangement, only one to two cars could be loaded at a time, cutting down the average daily tonnage to about 900 tons. About half of the 30,000 tons broken by the blast was mixed with dike rock and had to be wasted. Except for the difficulty of keeping the ore free of rock, the analysis was very satisfactory. The cargo analyzed as follows:

| Grade. | Tons | Iron | Phos. | Sil. | Moisture |
|---|---|---|---|---|---|
| Low Phos. Silica | 10,569 | 37.63 | .0145 | 41.94 | 2.10 |

During November we loaded a gondola car for "all rail" shipment to the J. D. Adams Manufacturing Co. at Indianapolis, Indiana. The analysis of this car was, Iron 39.00, Phos. .015.

The West Pit was operated for nine days during October until the seasons requirements were secured. Except for the intermittant operations, there was little or no trouble during the season. The equipment was in good shape and there were no delays of a serious nature during the entire season.

There was approximately 30,000 tons of broken ore left in the West Pit, with two rows of holes drilled across the face of this pit, which, when blasted will break between 200,000 and 225,000 tons of ore. At the East Pit there is no broken ore, or holes drilled for additional ore.

During the loading of the Low Phosphorous ore from the East Pit, we were forced to load and dump a considerable tonnage of mixed rock and ore. This was hauled to the rock dump at the West end of the West Pit. This was slow and more expensive than having the shovel handle and cast the tonnage twice, which was done after ore operations were completed.

f. Drilling, Blasting and Explosives.

The drilling program started after the blast made November 1st, 1930, was continued until completed at the West Pit. Five churn drills were operated until April 14th, when the last hole of a double row across the face of the West Pit was finished. The results were very satisfactory for winter drilling, both as to progress and cost.

At the East Pit one churn drill was operated continuously from November 3rd, 1930, when we started in on our winter drilling, until March 31st, 1931. At this time word was received from Cleveland that no ore would be mined from this pit during 1931, and to discontinue further operations here. We had completed all but about 6 holes for the first blast when we stopped drilling.

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7. OPEN PIT OPERATIONS (Continued)

f. Drilling, Blasting and Explosives

During the operating season we found it necessary to maintain a definite number of men on our track crew. These men were not kept busy all of the time, and as we had a number of churn drill men among this crew, from time to time we operated the churn drill at the East Pit, but charged the time to West Pit operations. In this way we completed a number of holes.

In September when word was received that a sale had been made of a cargo of Low Phosphorous ore from the East Pit, a crew was started and worked for four days day and night shift completing the necessary number of holes for making the blast. There were eight rows of holes ranging from five holes in the front row to eight and nine in the rear four rows. The depth of these holes averaged from 45 to 20 feet.

Statement of Holes Drilled, West Pit.

| | HOLES | | | FEET | | |
|---|---|---|---|---|---|---|
| Month | Number Drilled | Number Lost | Total | Drilled | Lost | Total |
| January | 24 | 1 | 25 | 2,263 | 68 | 2,195 |
| February | 21 | 0 | 21 | 2,075 | 0 | 2,075 |
| March | 20 | 1 | 21 | 1,976 | 50 | 1,926 |
| April | 5 | 1 | 6 | 404 | 77 | 327 |
| Total, | 70 | 3 | 73 | 6,718 | 195 | 6,523 |

Statement of Holes Drilled, East Pit

| | HOLES | | | FEET | | |
|---|---|---|---|---|---|---|
| Month. | Number Drilled | Number Lost | Total | Drilled | Lost | Total |
| January | 12 | 0 | 12 | 486 | 0 | 486 |
| February | 10 | 0 | 10 | 357 | 0 | 357 |
| March | 11 | 0 | 11 | 377 | 0 | 377 |
| July | 6 | 0 | 6 | 143 | 0 | 143 |
| September | 5 | 0 | 5 | 93 | 0 | 93 |
| Total, | 44 | 0 | 44 | 1,456 | 0 | 1,456 |

Recap of Holes Drilled West and East Pits.

| | HOLES | | | FEET | | |
|---|---|---|---|---|---|---|
| Pit | Number Drilled | Number Lost | Total | Drilled | Lost | Total |
| West | 70 | 3 | 73 | 6,718 | 195 | 6,523 |
| East | 44 | 0 | 44 | 1,456 | 0 | 1,456 |
| Total, | 114 | 3 | 117 | 8,174 | 195 | 7,979 |

In addition to the above holes drilled for the next blast at the West and East Pits during 1931, should be added the holes drilled during November and December 1930.

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7. OPEN PIT OPERATIONS (Continued)

f. Drilling, Blasting & Explosives (Cont'd)

Holes Drilled 1930-31 for Next Blast at West Pit.

| Year | Holes Drilled | Feet Drilled |
|---|---|---|
| 1930 | 36 | 3,404 |
| 1931 | 70 | 6,523 |
| TOTAL | 106 | 9,927 |

Holes Drilled 1930-31 For Blast of Sept. 10th, East Pit.

| Year | Holes Drilled | Feet Drilled |
|---|---|---|
| 1930 | 15 | 716 |
| 1931 | 44 | 1,456 |
| Total, | 59 | 2,172 |

Only one blast was made during the season of 1931, and that was at the East Pit. 59 Holes were blasted on September 10th. In making this blast the following fuse and powder were consumed:

| | |
|---|---|
| Double Countered Cordeau Fuse | 3,029 Ft. |
| Plain Cordeau Fuse | 1,009 Ft. |
| 90% Gelatin Powder | 2,100 Lbs. |
| 80% Gelatin Powder | 6,900 Lbs. |
| Gelamite "A" | 6,000 Lbs. |
| Total Powder | 15,000 |
| Estimated Tons broken | 30,000 Tons |

Statement of Blasts made in 1931

| Blast No. | Date | Location of Blast | No.of Holes | Total Depth | Pounds Powder | Tons Broken | Tons Per Ft.Hole | Tons Per Lb.Powder |
|---|---|---|---|---|---|---|---|---|
| 1 | Sep.10 | E.Pit | 59 | 2,172 | 15,000 | 30,000 | 14.78 | 2.00 |

It will be noted that the tons broken per foot of hole and tons per pound of powder is lower than in any of our previous blasts, which have averaged 24 tons per foot of hole and 3.5 tons per pound of powder. This is explained by our having loaded these holes heavy in order to insure good breakage of the bottom of the pit; also due to the fact that the holes were very shallow and that we blasted six rows at one time, reducing the spacing between the rows of holes.

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7. OPEN PIT OPERATIONS (CONTINUED)

f. Drilling, Blasting & Explosives (Cont'd)

Statement of Operating Churn Drills Year 1931.

7,720 Ft. of Holes Drilled.

| | Labor | Supplies | Total | Cost Per Foot. |
|---|---|---|---|---|
| Operating. | | | | |
| Drilling at Mine | 4,428.88 | 1,945.73 | 6,374.61 | .825 |
| Building Roads | 246.96 | 88.19 | 335.15 | .043 |
| Sharpening Bits | 588.61 | 347.61 | 936.22 | .120 |
| Pipe & Fittings | 56.70 | 143.84 | 200.54 | .026 |
| Rope | | 249.94 | 249.94 | .032 |
| Drill Bits | | | | |
| Electric Power | | 370.47 | 370.47 | .048 |
| Truck and Tractor | 485.58 | 392.64 | 878.22 | .114 |
| Total Operating | $5,806.73 | $3,538.42 | $9,345.15 | 1.208 |
| Maintenance. | | | | |
| Drills | 225.77 | 356.54 | 582.31 | .063 |
| Drill Sharpener | 45.63 | 41.15 | 86.78 | .011 |
| Total | 271.40 | 397.69 | 669.09 | .074 |
| 1931. | | | | |
| Total Maint. & Optg. | 6,078.13 | 3,936.11 | 10,014.24 | 1.282 |
| Total 1930, | 14,293.63 | 10,380.48 | 24,674.11 | 1.515 |

Cost of Drilling & Blasting, East Pit.

| Tons, 10,569 | PRIMARY | | SECONDARY | | Total | Per |
|---|---|---|---|---|---|---|
| | Amount | Per Ton | Amount | Per Ton | Amount. | Ton |
| Drilling, | 2,327.19 | .220 | 0 | 0 | 2,327.19 | .220 |
| Blasting, | 1,135.56 | .108 | 0 | 0 | 1,135.56 | .108 |
| Total 1931, | 3,462.75 | .328 | 0 | 0 | 3,462.75 | .328 |
| Total 1930, | 33,991.28 | .118 | 5,760.07 | .021 | 39,741.35 | .139 |

The cost of Drilling and Blasting figured in the above table is based on the tons of ore secured from the blast, amounting to 10,569 tons. Our estimate of the total tons of material broken was 30,000 tons, the difference being waste material which was dumped on the rock pile or cast to the south of the pit area. There was a large dike cutting across the ore blasted, which contaminated a large tonnage.

Statement of Drill Bits Sharpened.

| Month | Number of Sharpened | Feet of Holes Drilled | Feet of Hole Per Bit Used |
|---|---|---|---|
| January | 453 | 2749 | 6.07 |
| February | 407 | 2414 | 5.93 |
| March | 336 | 2353 | 7.00 |
| April | 104 | 404 | 3.88 |
| Total | 1300 | 7920 | 6.09 |