THE
CLEVELAND - CILFFS IRON CO.
MINING DEPARTMENT

ANNUAL REPORT OF GENERAL MANAGER
FOR
YEAR ENDING
DEC. 31 ST 1919

#1990

I N D E X .

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ANGELINE MINE:

HOLMES MINE:

NEGAUNEE MINE:

MAAS MINE:

ATHENS MINE:

SOUTH JACKSON MINE:

MORRIS-LLOYD CONT'D:

GWINN DISTRICT:

AUSTIN MINE:

STEPHENSON MINE:

PRINCETON MINE:

GWINN MINE:

GWINN MINE CONT'D:

REPUBLIC MINE:

MEADOW AND FOWLER MINES:

HILL-TRUMBULL MINE:

BOEING MINE:

HELMER MINE:

WADE MINE:

ENGINEERING DEPARTMENT:

GEOLOGICAL DEPARTMENT:

MECHANICAL DEPARTMENT:

MECHANICAL DEPT - CONT'D:

SAFETY DEPARTMENT:

PENSION DEPARTMENT:

PENSION DEPARTMENT (CONT'D):

January 1, 1920.

Mr. Wm. G. Mather, Pres.,

Cleveland, Ohio.

Dear Sir:-

I beg to submit the following report of the operations of the Mining Department for the year 1919. The inventories, maps, and statements relating to this 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 Mechanical, Engineering, Geological, Safety, and Welfare Departments by the heads of these departments.

All of our Superintendents and Engineers who were in Service have returned to work during the year. Mr. Elliott arrived the first of August and has resumed his position as General Superintendent. Mr. W. R. Myers, formerly Superintendent of the Spies Mine, has been transferred to the Mesaba Range as Assistant to Mr. Barber; Mr. Stevenson is now in charge of the Wade Mine as Superintendent; Messrs. Hayden, Nicholson, Mitchell, and Miller have returned to the Engineering Department. Mr. Brewer, formerly Mr. Jopling's Assistant, has been transferred to Hibbing, as Superintendent of the Boeing Mine, and Mr. Chenneour promoted to the position of Assistant Chief Engineer.

ANNUAL REPORT

OF THE

MORO MINE (1919)

There was no work done at the Moro Mine during 1919. This mine closed entirely.

ANNUAL REPORT

OF THE

LAKE MINE (1919)

Production and Shipments.

The Lake Mine worked 298 days in 1919, and produced 315,119 tons of ore, an average of 1,057 tons per day. As the stock-piles were not cleaned up, there was no overrun from them credited to production for the year. There is, however, an accumulated overrun of probably more than 20,000 tons in the stock-piles. The mine worked on double shift throughout the year.

19,290 tons of rock were mined, an average of 65 tons per day. All rock-work except timber-roads was incidental to mining.

Table I.

Production by Grades.

Grade	Total for Year		Average per Day	
	1919 Tons	1918 Tons	1919 Tons	1918 Tons
Lake	207,114	223,492	695	750
Lakedale	108,005	214,622	362	720
Total Ore	315,119	438,114	1,057	1,470
Rock	19,290	19,285	65	65
Total Ore and Rock	334,409	457,399	1,122	1,535

Table II.

Shipments.

Grade	Pocket Tons	Stock-Pile Tons	Total Tons
Lake	148,937	25,223	174,160
Lakedale	28,783	31,199	59,983
Total	177,720	56,422	234,143

All the Lake ore shipped from the pocket and all except a small tonnage of this grade shipped from the stock-pile was crushed. Neither stock-pile was cleaned up, and there were no shipments from Presqu' Isle.

Table III.

Stock-Pile Balances - Dec. 31st, 1919.

Grade	At Mine Tons	At Presqu' Isle Tons	Total Tons
Lake	54,808		54,808
Lakedale	128,279	48,226	176,505
Total	183,087	48,226	231,313

Table IV.

Division of Product by Levels.

Level	Ore Tons	Rock Tons	Total Tons
960' Sub-Level	39,773	448	40,221
945' Sub-Level	109,385	3,590	112,975
925' Sub-Level	90,528	5,842	96,370
910' Sub-Level	50,922	5,830	56,752
890' Sub-Level	18,860	2,690	21,550
880' Sub-Level	3,772	450	4,222
Fifth Level	1,879	440	2,319
Total	315,119	19,290	334,409

Table V.

Production by Months.

Month	Days	Ore Per Day Tons	Lake Tons	Lakedale Tons	Total Ore Tons	Rock Tons	Total Ore and Rock Tons
January	26	1,279	20,301	12,958	33,259	1,970	35,229
February	23	1,240	19,718	8,794	28,512	2,655	31,167
March	26	1,263	22,728	10,107	32,835	1,715	34,550
April	24	1,099	19,247	7,139	26,386	1,540	27,926
May	25	1,095	17,039	10,324	27,363	1,310	28,673
June	24	1,075	14,852	10,939	25,791	1,690	27,481
July	24	961	14,228	8,834	23,062	1,190	24,252
August	26	1,031	18,712	8,090	26,802	1,565	28,367
September	25	940	15,195	8,295	23,490	1,830	25,320
October	27	997	19,498	7,422	26,920	1,590	28,510
November	24	840	11,673	8,477	20,150	1,120	21,270
December	24	856	13,923	6,626	20,549	1,115	21,664
Year	298	1,057	207,114	108,005	315,119	19,290	334,409

Table VI.

Delays.

There were no delays that caused a loss of product during the year. Minor delays caused no loss, because of the great excess of hoisting capacity over production.

Table VII.

Estimate of Ore Reserves.

925' Sub-Level	2,000 Tons
910' Sub-Level	33,000 "
Fifth Level	94,000 "
Below Fifth Level	10,000 "
Total	139,000 "
Less 10% Rock and 10% Loss in Mining	28,000 "
Net Total	111,000 "

A factor of 11 cu. ft. per ton was used.

Exploration.

Underground Diamond Drilling.

In December 1918 Hole No. 502 was started vertically downwards from the cross-cut on the fifth level 420 feet south of the shaft, and was down 520 feet in diorite at the end of the year. This hole was continued to a depth of 1,586 feet, finding only diorite and unaltered iron-formation. Another hole, No. 503, was drilled to the north from the same location at an angle of 67° below the horizontal to a depth of 1,556 feet, but found no more than No. 502.

No. 504 was then drilled down from the fifth level at the south end of the south cross-cut at an angle of 87°, S. 17° W., and was stopped at a depth of 350 feet. It found only diorite and unaltered iron-formation. The total drilling amounted to 2,972 feet.

SURFACE.

New Construction.

E and A. No. 370 - Electric Air-Compressor.

A 2500 ft. Type PRE-2 electrically driven air-compressor, purchased from the Ingersoll-Rand Co., was erected in the engine-house, in the place previously occupied by the old Ideal engine. Work was started in February and completed in June. There was some delay, waiting for the erector to finish setting up the two compressors at the Cliffs Shaft Mine. The cost of installation was considerably higher than the estimate on account of the cost of removing the Ideal engine and its foundations.

Repairs to Coal-Dock.

The coal-dock was thoroughly repaired in April.

Trestles.

A new trestle was built east of the Lakedale pile in July, and was connected to the stock-pile in October. Little ore was shipped from this pile in the summer, and the new trestle gives additional room sufficient for the winter's production. The west trestle was extended 4 bents in November. Both trestles are for single-track only.

LAKE MINE.

The ground around No. 1 shaft was filled with rock again in July, and one track was taken out, so as to make room for the new stock-pile.

UNDERGROUND.

Development.

At the end of the year a winze was sunk 21 feet from the fifth level to the bottom of the ore-body to test the ultimate depth. Another winze will be sunk, from which part of the ore below the fifth level can be mined while the ore above is being exhausted. There is about 10,000 tons of ore below the fifth level. No other development is necessary, except opening new sub-levels.

The number of contracts was reduced during the year from 40 to 25, the average number being 31, of which 15 were stoping, 10 drifting in ore, 2 repairing and 4 in rock. The number of contracts will be reduced further early in 1920.

Stoping.

The same policy has been maintained in stoping as during the last four years, and the east and west ends of the ore-body have been worked down rapidly, leaving a wide pillar in the middle of the vein to protect the timber-roads and air-ways. The ends of the deposit are worked down low enough for economical mining, and the ventilation pillar is sliced off at the same rate as the rest of the mine. Following this system the ore west of the ventilation pillar has been mined back to Raise "WC," and little more can be taken from this side until the last operations, because it would bring too much weight on the main haulage-ways. The ore on the east side has been worked out as far west as Raise "EC" on the 925 foot sub-level, but is being opened on the 910 foot sub-level for a length of 650 feet east of the main cross-cut.

At the beginning of the year the ventilation pillar and much of the ore east of it on the 960 foot sub-level were still in place. This sub-level was finished entirely in July. The ore west of the ventilation pillar on the 945 foot sub-level was finished in 1918 and the ore east of the pillar was

being opened. This sub-level was completely mined out in 1919. The 925 foot sub-level was opened up and partly mined west of the ventilation pillar in 1918. In 1919 the west side was finished early in the year, and practically all the ore east of the ventilation pillar was mined. There were seven gangs working here in December.

The 910 foot sub-level was opened and the ore exhausted on the west side early in the year and the ore west of Raise "WC" on the 890 and 880 foot sub-levels, which are the lowest subs on this side, was also exhausted. The 910 foot sub-level has been opened and stoping has started east of the ventilation pillar. There are now ten gangs working on this sub-level. On the 890 foot sub-level two gangs are stoping on the west side of the ventilation pillar, and one gang is opening up on the east side.

LAKE MINE.

COMPARISON OF COST SHEETS FOR 1918 AND 1919.

The Lake Mine worked on double shift during all of 1918 and 1919. There was no stock-pile overrun in either year, as the piles were not cleaned up.

In 1918 wages were increased 10% successively on April 16th, August 1st, and October 1st. There was no change in 1919, so that the average wages for 1919 were 18.4% higher than the 1918 average.

Production decreased materially during the year, as the size of the ore-body decreased.

Production.

	Total Tons	Per Day Tons
Year 1918	438,114	1,470
Year 1919	315,119	1,057
Decrease	122,995	413

Labor.

	1918	1919
Average number of men	304	248
Average rate per day	$ 5.09	$ 5.71

Tons per Man per Day.

	1918	1919
Surface	19.80	15.16
Underground	6.41	5.91
Total	4.84	4.26

Cost of Production.

	1918	1919
Labor	$ 1.033	$ 1.300
Supplies	.335	.468
Total	$ 1.368	$ 1.768

E and A. 370. covering the cost of installation of a new air-compressor was charged out entirely against the ore for the year. The cost of operating the compressor was also greater for the mine than it would have been with the old machine. The total increase on this account amounted to ten cents a ton. The increase in average wages amounts to nineteen cents more. The increase in cost per ton is 40 cents, which leaves a balance of 11 cents to be accounted for. The extra cost was partly due to new trestles to handle the winter's output, but mostly to decreasing production with relatively small reduction in overhead expense.

GENERAL EXPENSE.

No. 26 - Insurance.

Riot insurance in 1918 cost $ 797.41, and $ 657.12 in 1919, a decrease of $ 134.29.

1918	$ 996.88	$ .002
1919	854.52	.003
Decrease	$ 142.36	
Increase		$ .001

No. 27 - Engineering.

Central Office charge.

1918	$ 998.79	$ .002
1919	1089.14	.003
Increase	$ 90.35	$ .001

No. 28 - Analysis.

The increase is due to 18.4% higher wages in 1919.

1918	$ 9680.56	$ .022
1919	11089.31	.035
Increase	$ 1408.75	$ .013

GENERAL EXPENSE. (Continued)

No. 30 - Personal Injury Expense.

1918	$ 11619.97	$ .027
1919	5458.74	.017
Decrease	$ 6161.23	$ .010

There were two fatal accidents in 1918 and none in 1919. The principal items were as follows:-

	1918	1919
Medical & Hospital Exp.	$ 1436.70	$ 1268.80
Compensation Charges	8359.68	1021.02
½ Day Funeral Expense	797.82	
Hospital Deficit	1025.77	3168.92
Total	$ 11619.97	$ 5458.74

No. 30a - Mine Office.

1918	$ 11179.35	$ .026
1919	12544.98	.040
Increase	$ 1365.63	$ .014

Increase in cost for clerk hire was $ 699.10. Nearly all of remainder is in Central Office charges to Mine Office Acct.

MAINTENANCE.

No. 125 - Tracks and Yards.

1918	$ 1930.61	$ .004
1919	4042.21	.013
Increase	$ 2111.60	$ .009

The increase is mostly in charges for railroad tracks in accordance with rulings of the Railroad Administration and to cost of filling and grading near old No. 1 shaft.

No. 126 - Docks, Trestles and Pockets.

1918	$ 1759.24	$ .004
1919	1568.52	.005
Decrease	$ 190.72	
Increase		$ .001

In 1918 the rock-dump cost $ 1242.58 and railroad pockets $ 516.66. In 1919 the rock-dump cost $ 1067.11 and railroad pockets $ 501.41.

No. 127 - Buildings.

1918	$ 3272.12	$ .007
1919	2908.01	.009
Decrease	$ 364.11	
Increase		$ .002

The principal items were as follows:-

	1918	1919
Repairing coal-dock	$ 1462.69	$ 1834.67
Repairing timber-tunnel	842.36	322.88
Engine and boiler-house	170.33	252.90
Office warehouse and shops	309.00	91.92
Repairs to dry	146.79	294.68
Top tram engine-house	14.16	14.85
Shaft-house	326.79	96.11
Total	$ 3272.12	$ 2908.01

No. 128 - Shop Machinery.

1918	$	$
1919	244.97	.001
Increase	$ 244.97	$ .001

The principal item was chain-blocks---$ 170.

No. 129 - Boiler Plant.

1918	$ 4666.32	$ .011
1919	1917.30	.006
Decrease	$ 2749.02	$ .005

In 1918 a coal crusher was installed, the economizer was rebuilt, new tubes were put in the feed-water heater and a new bottom in the 12 ft. cold water tank.

LAKE MINE.

MAINTENANCE. (Continued)

No. 130 - Hoisting Machinery.

1918	$ 647.88	$ .001
1919	1937.09	.006
Increase	$ 1289.21	$ .005

No hoisting ropes were charged out during 1918. In 1919 hoisting ropes cost $ 968.81. Repairs to hoist in 1919 included $ 200.00 for balance due Sullivan Machinery Co. on cost of new drum casting for skip hoist installed in 1917.

No. 131 - Compressors and Power Drills.

1918	$ 325.25	$ .001
1919	20003.86	.064
Increase	$ 19678.61	$ .063

The 1919 charges are mostly for E and A. 370, new electric air-compressor, and for circulation pump and motor.

No. 132 - Pumping Machinery.

1918	$ 2443.23	$ .006
1919	877.24	.003
Decrease	$ 1565.99	$ .003

In 1918 new parts for the Prescott steam-pump cost $ 126, and a 4-inch steam-line cost $ 648.95. A new gear and pinion for the electric pump cost $ 830.

No. 133 - Top Tram Engines and Cars.

1918	$ 1123.96	$ .003
1919	1675.60	.005
Increase	$ 551.64	$ .002

New rope cost $ 100, repairs to cars $ 200, and balance of increase is due to 18.4% increase in average wages.

No. 134 - Skips and Skip-Roads.

1918	$ 1337.31	$ .003
1919	904.48	.003
Decrease	$ 432.83	$ .000

In 1918 repairs to skips, cages and guides cost $ 838.88.

No. 135 - Underground Tracks and Cars.

1918	$ 1975.66	$ .005
1919	2949.36	.009
Increase	$ 973.70	$ .004

	Labor	Supplies	Total
1918	$ 672.53	$ 1303.13	$ 1975.66
1919	1865.46	1083.90	2949.36
	Inc. $ 1192.93	De. $219.23	In. $973.70

During 1918 underground trackman's labor was all charged to main line tracks. During 1919 the trackman's time was divided between main line tracks and underground tracks, as it was found that a considerable portion of his time was spent putting in frogs and switches for sub-level tracks.

No. 136 - Electric Tram Plant.

1918	$ 9504.53	$ .022
1919	7976.36	.025
Decrease	$ 1528.17	
Increase		$ .003

The west side of the fifth level was finished in 1919. Fewer motors and cars are in use.

MAINTENANCE. (Continued)

No. 137 - Telephones and Safety Devices.

1918	$ 1802.30	$ .004
1919	2130.79	.007
Increase	$ 328.49	$ .003

The principal items were as follows:-

	1918	1919
Mine telephones	$ 194.49	$ 224.19
Safety Gates and Underground Improvements	1585.31	1783.40
Injured persons	22.50	4.88
Sign bonds and signals		.34
Miscellaneous:-		
Engine House, Electric Compressor		117.98
Total	$ 1802.30	$ 2130.79

No. 139 - Lake Angeline Drainage.

1918	$ 2321.48	$ .005
1919	1071.52	.003
Decrease	$ 1249.96	$ .002

Repairs to pipe-line and pumps were much lighter in 1919 than in 1918.

No. 140 - Fire Expense and Damage.

1918	$ 211.12	$ .000
1919		
Decrease	$ 211.12	$ .000

There was no fire in 1919. In 1918 there was a fire in the coal-dock.

MINING EXPENSE.

No. 150 - Air-Pipes.

1918	$ 1830.56	$ .004
1919	1881.79	.006
Increase	$ 51.23	$ .002

No. 151 - Compressors.

1918	$ 19735.27	$ .045
1919	17172.65	.054
Decrease	$ 2562.62	
Increase		$ .009

The decrease in total charges is due to less air used and to shifting boiler-house expense to hoisting after the new compressor started.

No. 152 - Hoisting.

1918	$ 20046.85	$ .046
1919	25914.34	.082
Increase	$ 5867.49	$ .036

The increase is partly due to higher average wages and mostly to shifting boiler-house expense to the hoist after the new compressor started.

No. 153 - Pumping.

1918	$ 11127.28	$ .025
1919	13427.67	.043
Increase	$ 2300.39	$ .018

The increase is due to higher wages and more water pumped.

No. 155 - Rock Drifting.

1918	$ 34859.93	$ .079
1919	22280.07	.071
Decrease	$ 12579.86	$ .008

There was a decrease of 2,501 feet of rock drifting in 1919.

MINING EXPENSE. (Continued)

No. 156 - Breaking Ore.

1918	$ 262955.52	$ .600
1919	223381.41	.709
Decrease	$ 39574.11	
Increase		$ .109

The increase in cost per ton is due to higher average wages and the decrease in total expense to 122,995 tons less ore mined.

No. 157 - Tramming.

1918	$ 36684.59	$ .084
1919	27857.62	.088
Decrease	$ 8826.97	
Increase		$ .004

The decrease is due to smaller production.

No. 158 - Filling.

1918	$ 1674.85	$ .004
1919	1846.51	.006
Increase	$ 171.66	$ .002

The increase is due to higher wages.

No. 159 - Timbering.

1918	$ 94926.01	$ .217
1919	87535.74	.278
Decrease	$ 7390.27	
Increase		$ .061

The decrease is due to less timber used and to the reduced area of the mine to maintain.

No. 160 - Captain and Bosses.

1918	$ 13566.63	$ .031
1919	15449.58	.049
Increase	$ 1882.95	$ .018

The increase is due to higher wages.

No. 161 - Dry-House.

1918	$ 8117.22	$ .019
1919	8208.56	.026
Increase	$ 91.34	$ .007

No. 162 - Top Landing and Tramming.

1918	$ 11733.04	$ .027
1919	13755.03	.044
Increase	$ 2021.99	$ .017

The increase is due to higher wages and to shorter shipping season.

No. 163 - Stocking Ore.

1918	$ 7280.38	$ .017
1919	9439.28	.030
Increase	$ 2158.90	$ .013

The increase is due to higher wages and to the erection of a new trestle east of No. 1 shaft.

No. 164 - Sorting Ore.

1918	$ 61.39	$ .000
1919	391.08	.001
Increase	$ 329.69	$ .001

The increase is due to more rock-picking on the stock-pile in 1919.

MINING EXPENSE. (Continued)

No. 166 - Cave-In.

1918	$ 3224.82	$ .007
1919	4638.30	.015
Increase	$ 1413.48	$ .008

The increase is due to higher wages, moving pumps in the Lake bottom, and to heavy run-off in the spring.

No. 167 - Lake Angeline Drainage.

1918	$ 1480.44	$ .003
1919	1485.98	.005
Increase	$ 5.54	$ .002

No. 171 - Ventilation.

1918	$ 2160.93	$ .005
1919	1398.88	.004
Decrease	$ 762.05	$ .001

With the decreased size of the mine-workings it was not necessary to run the fan all the time in the winter in 1919.

RECAPITULATION.

	Year 1918		Year 1919		Increase		Decrease	
	Total	Per Ton	Total	Per Ton	Total	Per Ton	Total	Per Ton
General Expense	34475.55	.079	31036.69	.098		.019	3438.86	
Maintenance	33321.01	.076	50207.31	.159	16886.30	.083		
Mining Expense	531465.71	1.213	476064.49	1.511		.298	55401.22	
Cost of Production	599262.27	1.368	557308.49	1.768		.400	41953.78	

LAKE MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR 1919.

GRADE	IRON	PHOS.	SILICA
Lakedale,	58.95	.239	5.34
Lake,	61.05	.120	4.14

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR 1919.

GRADE	IRON	PHOS.
Lakedale,	(All Mixed)	
Lake,	61.03	.131-(This means 15 cargoes all crushed and consigned to Michigan Ports for Charcoal Furnaces.)

ORE STATEMENT - DECEMBER 31ST, 1919.

	LAKE ORE AT MINE	LAKEDALE AT MINE	LAKE ORE STOCKED AT PRESQUE ISLE	TOTAL	TOTAL LAST YEAR
On hand January 1st, 1919,	21,854	80,257	48,226	150,337	112,152
Output for Year,	207,114	108,005		315,119	438,114
TOTAL,	228,968	188,262	48,226	465,456	550,266
Shipments,	174,160	59,983		234,143	399,929
Balance on Hand,	54,808	128,279	48,226	231,313	150,337
Decrease in Output-28%				122,995	
Increase in ore on hand,				80,976	

1919 - 2-8 Hour shifts for year
1918 - 2-8 Hour shifts for year

SHIPMENTS FOR YEAR 1919.

GRADE	POCKET	STOCKPILE	P.I.ST.PILE	TOTAL	TOTAL LAST YEAR
Lake,	145,292	28,868	0	174,160	221,178
Lakedale,	35,244	24,739	0	59,983	178,751
TOTAL,	180,536	53,607	0	234,143	399,829
Total last year,	296,690	103,239	0	399,829	
Decrease - 41%				165,686	

LAKE MINE.

LAKE MINE.

COMPARATIVE MINING COST FOR YEAR.

	1919.	1918.	INCREASE.	DECREASE.
PRODUCT	315,119	438,114		122,995
General Expense	.098	.079	.019	
Maintenance	.159	.076	.083	
Mining Expense	1.511	1.213	.298	
Cost of Production	1.768	1.368	.400	
Exploratory	.036	.004	.032	
DEPRECIATION.				
Original Purchase	.355	.355	-	
Plant Account	.002	.002	-	
Total Depreciation	.357	.357	-	
Taxes	.082	.069	.013	
Central Office	.058	.060		.002
Supply Inventory	-	.017		.017
Sundry Expense	.007	.030		.023
Fire Loss	-	.001	.001	
Cost on Stockpile	2.308	1.904	.404	
Loading & Shipping	.065	.063	.002	
Total Cost on Cars	2.373	1.967	.406	
No.Days Operating	298	298	-	
No.Shifts and Hours	2-8hr	2-8hr		
Avg.Daily Product	1,057	1,470		413
COST OF PRODUCTION.				
Labor	1.300	1.033	.267	
Supplies	.468	.335	.133	
Total	1.768	1.368	.400	

LAKE MINE.

COMPARATIVE WAGES AND PRODUCT.

	1 9 1 9.	1 9 1 8.	INCREASE.	DECREASE.
PRODUCT	315,119	438,114		122,995
No. Shifts and Hours	2-8hr	2-8hr		
AVERAGE NO. MEN WORKING				
Surface	69	74		5
Underground	179	229		50
Total	248	303		55
AVERAGE WAGES PER DAY				
Surface	5.00	4.24	.76-18%	
Underground	5.98	5.36	.62-11.5%	
Total	5.71	5.09	.62-12.1%	
WAGES PER MONTH OF 25 DAYS				
Surface	125.00	106.00	19.00	
Underground	149.50	134.00	15.50	
Total	142.75	127.25	15.50	
PRODUCT PER MAN PER DAY				
Surface	15.18	19.80		4.62
Underground	5.92	6.41		.49
Total	4.26	4.84		.58
LABOR COST PER TON				
Surface	.330	.214	.116	
Underground	1.011	.836	.175	
Total	1.341	1.050	.291-26.6%	
AVG. PRODUCT BRK'G & TRM'G	8.41	8.67		.26
" WAGES CONTRACT MINERS	6.08	5.58	.50	
" " " LABOR	6.08	5.58	.50	
TOTAL NUMBER OF DAYS				
Surface	20,763¾	22,135¼		1,371½
Underground	53,279¼	68,311¾		15,032½
Total	74,043	90,447		16,404
AMOUNT FOR LABOR				
Surface	103880.95	93823.24	10057.71	
Underground	318831.87	366423.27		47591.40
Total	422712.80	460246.51		37533.71

Proportion Surface to Underground Men:

1919 - 1 to 2.59
1918 - 1 to 3.09
1917 - 1 to 3.32
1916 - 1 to 2.79
1915 - 1 to 3.26
1914 - 1 to 3.42

LAKE MINE.

TIMBER STATEMENT FOR YEAR ENDING DECEMBER 31, 1919.

KIND.	LINEAL FEET.	AVG. PRICE PER FOOT.	AMOUNT 1919.	AMOUNT 1918.
4" to 6" Timber				80.96
6" to 8" "	60,514	.0248	1497.91	1215.22
8" to 10" "	102,766	.0751	7721.84	8169.84
10" to 12" "	83,133	.1049	8716.54	10393.18
12" to 14" "	11,648	.1270	1478.72	2220.88
Total - 1919	258,061	.0752	19415.01	
Total - 1918	358,354	.0602		22080.08
	LINEAL FEET.	PER 100'.		
5' Lagging	906,313	.748	6783.11	7476.60
6' "	29,001	.695	201.51	731.50
7' "	39,248	.581	227.86	287.38
8' "	18,000	.875	157.50	18.94
Total Lagging	992,562	.743	7369.98	8514.42
Poles	27,500	.929	255.60	73.50
Total - 1919	1,020,062	.748	7625.58	
Total - 1918	1,263,501	.680		8587.92

Product	315,119	438,113
Feet Timber per ton of Ore	.819	.818
Feet Lagging "	3.150	2.867
Feet Lagging per Ft. of Timber	3.846	3.505
Cost per ton for Timber	.0616	.0504
" Lagging	.0234	.0194
" Poles	.0008	.0002
" Timber, Lagging & Poles	.0858	.0700
Equivalent of stull timber to Board Measure	464,040	783,600
Ft. Board Measure per Ton of Ore	1.47	1.79
Total Cost for Timber, Lagging & Poles - 1919		27040.59
" 1918		30668.00
" 1917		28753.10
" 1916		25050.94
" 1915		21780.39
" 1914		18406.67
" 1913		24128.99
" 1912		21525.33
" 1911		19916.58

LAKE MINE.

STATEMENT OF EXPLOSIVES USED FOR BREAKING ORE.

KIND.	QUANTITY.	AVERAGE PRICES.	AMOUNT 1 9 1 9.	AMOUNT 1 9 1 8.
50% Powder L.F.Standard 1¼"				302.72
50% " " 1½	59,900	.1806	10819.86	16282.72
60% " Gelatine 1¼				85.60
Total Powder	59,900	.1806	10819.86	16671.04
Fuse	166,800	8.19	1365.69	1742.04
Caps	47,500	14.22	675.60	866.77
Cap Crimpers	11	.56	6.17	7.28
Connecting Wire	2	.39	.78	5.26
Total Fuse, Etc.			2048.24	2621.35
Total All Explosives			12868.10	19292.39
Product			315,119	438,113
Pounds Powder per ton of Ore			.190	.184
Cost per ton for Powder			.0343	.0380
" Fuse, Caps, Etc.			.0065	.0060
" All Explosives			.0408	.0440
Avg.Price per Lb. for Powder			.1806	.2074

ANNUAL REPORT

OF THE

CLIFFS SHAFT MINE (1919)

Production and Shipments.

The Cliffs Shaft Mine worked 298 days in 1919, and produced 366,773 tons of ore, an average of 1,231 tons per day. No ore was shipped from the crushed stock-pile and very little from the lump pile. Practically no crushed ore was shipped from the pocket, and lump shipments were not large enough to take care of all the ore of this grade hoisted during the shipping season. The ore was screened during most of the year, but in part of May and June it was necessary to crush the entire product, as the lump stock-pile was full. Additional room for lump and crushed ore was provided for stocking ore during the winter. The trestles and engine for the lump ore are nearly ready for service.

11,128 tons of rock were produced during the year, all of which was dumped underground.

The mine worked underground on single-shift during the year, hoisting being done on both shifts. The average number of contracts was 60.

Trammers were particularly scarce during the summer months, and there was a shortage throughout the year. There was no scarcity of miners or of surface labor.

Nearly all shipments stopped in August during the dock-mens' strike.

Table I.

Production by Grades.

Grade	Year 1918		Year 1919	
	Tons	Per Cent	Tons	Per Cent
Lump	262,379	70.2	211,962	57.8
Crushed	111,355	29.8	154,811	42.2
Total	373,734	100.0	366,773	100.0

Table II.

Comparison of Product for 1918 and 1919.

	1918	1919
Days Worked	298	298
Ore, Tons	373,734	366,773
Rock, Tons	9,070	11,128
Total Ore and Rock, Tons	382,804	377,901
Ore per Day, Tons	1,254	1,231
Rock per Day, Tons	31	37
Ore and Rock per Day, Tons	1,285	1,268

Table III.

Distribution of Ore and Rock by Levels.

	"A" Shaft			"B" Shaft			Both Shafts		
Level	Ore Tons	Rock Tons	Ore and Rock Tons	Ore Tons	Rock Tons	Ore and Rock Tons	Ore Tons	Rock Tons	Ore and Rock Tons
1	504		504	19,149	200	19,349	19,653	200	19,853
2	18,408		18,408	8,374		8,374	26,782		26,782
3	1,693		1,693	93		93	1,786		1,786
4	13,435		13,435	6,140		6,140	19,575		19,575
5	11,961	4,960	16,921	8,023	80	8,103	19,984	5,040	25,024
6	32,094	1,080	33,174	20,107	160	20,267	52,201	1,240	53,441
7	32,548	500	33,048	23,024	190	23,214	55,572	690	56,262
8	22,753	498	23,251	10,599	70	10,669	33,352	568	33,920
9	51,840	470	52,310	4,961	480	5,441	56,801	950	57,751
10	4,490	80	4,570	12,746	260	13,006	17,236	340	17,576
11	6,979	50	7,029	10,594	300	10,894	17,573	350	17,923
12	4,027	200	4,227	17,421	350	17,771	21,448	550	21,998
13				21,132	550	21,682	21,132	550	21,682
14				3,395	500	3,895	3,395	500	3,895
15				283	150	433	283	150	433
Total	200,732	7,838	208,570	166,041	3,290	169,331	366,773	11,128	377,901

Table IV.

Production by Months.

Month	Days Worked	Ore per Day Tons	Crushed Ore Tons	Lump Ore Tons	Total Ore Tons	Rock Tons	Total Ore and Rock Tons
January	26	1,436	12,711	24,612	37,323	956	38,279
February	23	1,350	10,807	20,254	31,061	1,244	32,305
March	26	1,354	12,321	22,881	35,202	1,258	36,460
April	24	1,224	11,512	17,875	29,387	1,076	30,463
May	25	1,235	23,893	6,976	30,869	1,084	31,953
June	24	1,276	15,452	15,162	30,614	782	31,396
July	24	1,136	9,405	17,870	27,276	910	28,186
August	26	1,038	15,472	11,518	26,990	662	27,652
September	25	1,171	11,531	17,736	29,267	628	29,895
October	27	1,260	11,986	22,026	34,012	770	34,782
November	24	1,179	10,456	17,829	28,285	832	29,117
December	24	1,103	9,265	17,223	26,487	926	27,413
Year	298	1,231	154,811	211,962	366,773	11,128	377,901

Table V.

Shipments.

	Pocket Tons	Stock-Pile Tons	Total Tons
Crushed Ore	1,661		1,661
Lump Ore	83,755	11,718	95,473
Total	85,416	11,718	97,134

Table VI.

Ore in Stock, January 1st, 1920.

Cliffs Shaft Crushed	181,209 Tons
Cliffs Shaft Lump	190,192 "
Total	371,401 "

Table VII.

Delays.

Date 1919	Hours	Tons Lost	Cause	Cost
Feb. 12	3	150	"B" Shaft hoist-motor burnt out.	$ 75.33
Mar. 14	5	300	"B" Shaft hoist-motor burnt out.	125.55
Mar. 15	8	600	"B" Shaft hoist-motor burnt out.	200.88
Apr. 3	3½	280	"B" Shaft hoist-motor burnt out.	87.89
Apr. 4	1½	170	"B" Shaft hoist-motor burnt out.	37.66
Apr. 28	2	200	Mud in "B" Shaft pocket.	3.50
May 3	4	300	Runner broke on surface in "B" Shaft.	21.20
May 15	1½	150	Belt broke in crusher.	2.80
May 17	3	475	"B" Shaft hoist-motor burnt out.	75.33
May 26	2	125	No current.	
June 2	2	150	"B" Shaft hoist-motor burnt out.	50.22
June 5	3	175	No current.	
June 11	4	100	Bolt on "B" Shaft hoist-motor burnt out.	100.44
June 21	1	200	Shaft on crusher-head broke.	6.30
July 12	4	300	"B" Shaft skip stuck in rock-dump.	7.45
July 16	4	300	Henry Karkkainen's funeral.	
July 23	1	50	No air - no electric power.	
July 25	4	350	John Rukonen's funeral.	
July 28	3	555	Pocket blocked 15th level "A" Shaft. "B" Shaft repairs.	24.96
July 29		400	"B" Shaft repairs.	24.96
July 30	1	450	No railroad cars. "B" Shaft repairs.	24.96
July 31		450	"B" Shaft repairs.	24.96
Aug. 1		320	"B" Shaft repairs.	118.40
Aug. 2		343	"B" Shaft repairs.	126.91
Aug. 4		272	"B" Shaft repairs.	100.64
Aug. 5	8	456	"A" Shaft top tram car broke. "B" Shaft repairs.	168.72
Aug. 6		296	"B" Shaft repairs.	109.52
Aug. 7		293	"B" Shaft repairs.	108.41
Aug. 8		293	"B" Shaft repairs.	108.41
Aug. 9		324	"B" Shaft repairs.	119.88
Aug. 11		279	"B" Shaft repairs.	103.23
Aug. 12		233	"B" Shaft repairs.	86.21
Aug. 13		166	"B" Shaft repairs.	61.42
Aug. 14		53	"B" Shaft repairs.	6.80
Aug. 20	1		Transformer burnt out at sub-station.	
Aug. 25	5	300	"B" Shaft hoist-motor burnt out.	125.55
Oct. 4	2	250	Crusher jammed.	5.80
Oct. 28	3	150	Car over dump on stock-pile.	12.00
Nov. 14	3	300	No air. No electric current.	
Dec. 4	2	200	Axle broke on top tram car.	8.00
Total	84½	10,758		$ 2,264.29

Table VIII.

Delays Caused by Lack of Current on Main Line.

Date	Hours	Tons Lost
May 26	2	125
June 5	3	175
July 23	1	50
Nov. 14	3	300
Total	9	650

Table IX.

Ore mined during the year from C.I.M. Co.'s land 14,394 Tons

Table X.

Estimate of Ore Reserves.

	"A" Shaft Tons	"B" Shaft Tons	Total Tons
Pillars	910,000	624,000	1,534,000
Floors	1,584,000	939,000	2,523,000
Partly Developed	573,000	10,000	583,000
Total	3,067,000	1,573,000	4,640,000
Less 10% Rock	307,000	157,000	464,000
Net Total	2,760,000	1,416,000	4,176,000
To Support Surface	1,553,000	913,000	2,466,000
Available Ore	1,207,000	503,000	1,710,000
Less 10% Rock and 10% Loss in Mining	241,000	101,000	342,000
Net Available Ore Jan. 1st, 1920.	966,000	402,000	1,368,000

Recapitulation.

	Developed Tons	Prospective Tons	Total Tons
Available Ore	1,407,000	303,000	1,710,000
Less 10% Rock and 10% Loss in Mining	281,000	61,000	342,000
Net Available Ore	1,126,000	242,000	1,368,000

Fatal Accident to Henry Karkkainen.

At about 11:30 P.M. on Thursday, July 10th, Henry Karkkainen, a Finn, tramming rock on the thirteenth level in "B" shaft, was struck by a piece of ore, which fell from the back, while he was standing by his car at the chute. The piece of ore struck the edge of the car, and rebounding, hit him in the chest, breaking his ribs. At the time of the accident he did not seem to be seriously hurt, but it was found later that a rib had pierced his lung, and he died Sunday night, July 13th.

Henry Karkkainen was known for a long time as Henry Johnson. He was 45 years old, married, and leaves a widow and three children.

Fatal Accident to John Rukonen.

At about 10:30 A.M., July 23d, John Rukonen, tramming from #13 stope on the sixth level in "B" shaft at the Cliffs Shaft Mine, was instantly killed by a fall of ground. While he was shovelling beside his car, a slab of ore weighing about a ton fell out of the side of the pillar beside him, and sliding down the pile, crushed him against the car. This side of the pillar had been barred the night before, but no one noticed this loose piece, which was held in place and partly buried by the broken ore of the pile. The removal of some of the pile released the slab, and allowed it to fall. The pile was about 12 feet high at this point.

Rukonen was a Finn, 28 years old, and had been tramming for us for nearly 6 years. He was a particularly good man. He was married, and is survived by a wife and one small child.

Repairs to "B" Shaft.

The timber between the tenth and fifteenth levels in "B" shaft was repaired on Sundays from the first of the year until April.

"B" Shaft was shut down for repairs from July 28th to August 14th. During this time the shaft was retimbered from surface to a depth of 40 feet, which is below water-level. The loss of product amounted to 5,000 tons.

Power.

There was a shortage of electric power early in March and in October and December. During the first two periods both the pumps and compressor were run by steam. In December the compressor only was run by steam.

New Construction.

Increase in Stock-Pile Capacity.

The gardens north of the mine-water ditch were taken over, graded and partly covered with plank to make room for stocking crushed ore. The track south of the stock-pile was covered.

To make room for the lump ore additional floor space was graded and covered with plank. Two trestles were built up-grade from the pocket and a hoisting engine installed beyond the end of the pile. Owing to delay in delivery of this hoist and of plank the new plant was not ready for operation until the end of the year.

During the summer months the available room east of the crushed stock-pile was entirely filled, and ore was not dumped south of the track until the middle of October.

E and A. 370.

Two electrically driven Class PRE-2 air-compressors, made by the Ingersoll-Rand Co., were purchased early in the year, and installed in the engine-house in the places occupied by the Model 1884 Rand Compressor and the 150 H.P. Steam-Turbine, which were both taken out. The old compressor was sold for scrap, and the turbine was stored in the yard.

The cost of installation of these compressors exceeded the estimate of the Mechanical Department, because of the complicated old foundations that had to be torn out.

The cost of installation was as follows:-

	Estimate	Total Cost
(1) Two Compressors and Motors,	$ 30,000.00	$ 30,057.40
(2) Freight	1,000.00	751.18
(3) Installing	3,200.00	7,355.63
Total	34,200.00	38,164.21
Contingencies	420.00	
Grand Total	$ 34,620.00	$ 38,164.21

E and A. 379. New Concrete Shaft-Houses.

As both "A" and "B" shaft-houses were very rotten, it was necessary to put up new structures. Either steel or wooden structures would have necessitated shutting down each shaft for about six weeks, and the cost of steel was very high. Two concrete shaft-houses were accordingly built, entirely enclosing the old structures. There was no interruption in hoisting on account of the new construction. The old shaft-houses have not been torn down yet, as the head-sheaves will not be moved to the new beams until January. Work was started in July and the last concrete was poured in December.

The T. L. Condron Company and Mr. George W. Maher were employed as consulting engineers and architect.

The cost of construction is shown in the following table.

	Estimate	Total To Date	Unexpended Balance
(1) 1,866 Cu. Yds. Concrete, Including Forms	$ 37,320.00	$ 37,705.04	$ -385.04
(2) Tearing Down Old Shaft-Houses	2,500.00	647.98	1,852.02
(3) Moving Sheaves and Building Floors, Stairways, Windows and Doors	2,500.00	1,296.72	1,203.28
(4) Tie Rods and Reinforcing	1,600.00	8,291.96	-6,691.96
(5) Moving Tracks and Lengthening Chutes	300.00	628.35	-328.35
(6) Lighting and Heating	300.00	375.44	-75.44
(7) Local Office and Supervision	1,000.00	1,349.68	-349.68
(8) Consulting Engineers, Fees and Expenses, and Travelling Expenses	2,500.00	1,842.50	657.50
Total	48,020.00	52,137.67	-4,117.67
10% for Contingencies	4,800.00		4,800.00
Grand Total	$ 52,820.00	$ 52,137.67	$ 682.33

The cost of reinforcing steel exceeded the estimate on account of an error in the bar-list furnished by the consulting engineers. The salvage value of the forms will more than pay for the labor of taking them down.

All charges for new construction were charged out as incurred.

Repairs to Buildings.

The coal-dock was repaired, and a new roof was put on the shed between the coal-dock and the boiler-house.

A concrete floor was laid in the machine-shop.

Exploration.

Underground Diamond Drilling.

Nineteen holes were drilled underground during the year, but no large amounts of ore were found. A description of this work will be given in the Geologist's report. The following table sets forth the principal facts:-

Underground Diamond-Drill Holes.

Hole No.	Depth Feet	Ore Feet	Shaft	Level	Direction	Inclination Degrees	Vein
293	400	0	"A"	4	S. 70 W.	0°	South Lens
294	180	60	"A"	6	S.	0°	North Deposit
295	190	37	"A"	9	S.	0°	South-East Deposit
296	182	15	"B"	10	N. 89° W.	0°	Main Vein
297	100	0	"B"	10	N. 43° W.	0°	Main Vein
298	310	3	"B"	10	S. 45° W.	0°	Fault Vein
299	307	5	"B"	10	N. 45° W.	0°	Main Vein
300	230	2	"B"	11	N.	0°	Main Vein
301	210	0	"B"	9	N. 14° E.	0°	North Deposit
302	176	20	"B"	8	N. 35° E.	0°	North Deposit
303	210	0	"B"	5	N. 15° E.	0°	North Deposit
304	118	0	"A"	6		-90°	South Lens
305	320	10	"A"	8	S. 5° E.	0°	South-East Deposit
306	95	0	"A"	6	S.	-45°	South Lens
307	120	12	"A"	6	W.	-45°	South Lens
308	126	14	"A"	6	E.	-49°	South Lens
309	100	0	"A"	6	N. 10° W.	0°	South Lens
310	185	0	"B"	7	S. 45° W.	0°	Fault Vein
311	138	0	"B"	2	S. 70° E.	0°	Fault Vein
Total	3,697	168					

Pumping Out No. 3 Mine.

The shaft behind the general barn at the Hard Ore was retimbered down to water-level and cleaned out, and on August 28th pumping was started using a 1,000 gal. centrifugal electric sinking-pump, obtained from the Austin Mine. This pump discharges through a 6-inch pipe into the Saw Mill Pit, from which the water drains into the city sewer. The water was 35 feet below the collar of the shaft when pumping started, and has been lowered 164½ feet, standing at the first level at the end of the year.

Two 300-gal. sinking pumps have been obtained from the Gardiner-Mackinaw Mine to be used on the inclined skip-road below the knuckle at the shaft. A 300-gal. centrifugal pump has also been borrowed from the McClure Power Plant.

UNDERGROUND.

General Development.

Developments underground have continued to be encouraging. Work has not been resumed in the stopes, which were stopped last year, at the east end of the Main Vein in "A" shaft, on account of the dangerous proximity of stopes filled with water in the Incline Mine. Connection will be made as soon as possible after No. 3 Mine and the Incline have been pumped out. The South-East Deposit has shown unexpected width on the ninth level, and on the eighth level the raise started last year reached the elevation of the fifth level, and another raise, 200 feet further west, has been put up to the elevation of the sixth level. This ore has been reached by a drift on the fifth level. The east end of the North Vein on the sixth, seventh, eighth and ninth levels has shown up new ore during the year. Good ore has been opened up on the eleventh and twelfth levels.

In "B" shaft the ore below the tenth level has shown up well, but little new ore has been found on the upper levels. One new level, the fourteenth, has been opened up, and a larger number of contracts have been working on the lower levels than last year.

The following tables show a classification of the contracts by occupation, and a comparison between 1918 and 1919, the figures being averages for the year.

Classification of Contracts.

Kind of Work	"A" Shaft	"B" Shaft	Total
Stoping	13	11	24
Floors	9	8	17
Backs	3	2	5
Ore Raises and Drifts	5	2	7
Rock	4	3	7
Total	34	26	60

Comparison Between 1918 and 1919.

	"A" Shaft		"B" Shaft		Total	
	1918	1919	1918	1919	1918	1919
Developing New Ore	14	15	11	11	25	26
Mining Known Reserves	18	15	15	12	33	27
Rock	3	4	1	3	4	7
Total	35	34	27	26	62	60

There were two less contracts than in 1918, and the number of contracts developing new ore has increased one and the number depleting known reserves has decreased six.

Description of Work Done.

"A" Shaft.

There was no ore mined on the first level. On the second level two contracts have been mining the floor of a sub-level below the first level at the east end of the Main Vein throughout the year. There is a little ore left here. Another contract mined the floor of one of the old stopes on the first level, 200 feet north-east of "B" shaft, and are now stoping to the north under

the jasper, which was the foot-wall on the first level. Another gang is mining the floor of an old stope in the North Deposit, 500 feet north-east of "B" shaft, working from a raise put up from the fourth level.

On the fourth level one gang is finishing the floor left under the drift 300 feet north-east of the shaft. This is the only available ore left in the vein referred to as the "Small Body" in the old reports. In the North Deposit, 700 feet north-west of "A" shaft, one contract stoped west to the end of the ore, and another raised to the first level, and is now mining the floor of the second level.

On the fifth level one gang has stoped west in the North Deposit, following a vein of ore about 20 feet wide. They are now 700 feet north-west of "A" shaft. Another gang drifted west 40 feet in rock and are raising to the fourth level 80 feet further north. In the South Lens the ore on the south side of the anticline was followed west to the end, and raises were put up to mine the floor of the fourth level. One contract is working here, 580 feet south-east of "A" shaft. A long rock-drift has been driven 580 feet from the South Lens to the South-East Deposit, and one contract is drifting in the ore now. One contract has been mining the floor of the east lens of the Main Vein, from 800 feet to 1,000 feet east of "A" shaft, and another has mined the floor of the North Deposit near the boundary, 700 feet north-east of "A" shaft. Both gangs worked in these places throughout the year.

On the sixth level one contract followed the ore west on the south side of the anticline in the South Lens, 650 feet south-east of the shaft, to the end, and then cross-cut south to the south boundary line in rock. They cut out for the diamond-drill at the south end of the long cross-cut, raised on the foot-wall to the fifth level, and then moved to the seventh level. In the North Deposit one contract mined floors during the first half of the year, 1200 feet north-east of the shaft, and two contracts have been stoping in new ore at the east end of the vein. This is the ore found by Diamond-Drill Holes 287 and 294.

On the seventh level most of the floors and backs along the south side of the South Lens, and part of the back over the north stope in the Main Vein from 800 to 1200 feet east of the shaft, have been mined during the year. One gang is mining the back 1200 feet east of the shaft at the end of the year. In the North Deposit a rock drift is being driven north-west to the North Deposit 1200 feet east of the shaft, and one gang is stoping and another raising 1800 and 1950 feet east of the shaft. These two gangs are opening up new territory.

On the eighth level in the South Lens one contract has mined the backs and the floor of the seventh level in the west stopes, and two other contracts have mined the floors of the stopes further east. In the South-East Deposit the raise started last year, 1360 feet south-east of the shaft, was put up to the fifth level in ore, and another raise was put up in ore from a new stope, 200 feet farther west, to the sixth level. The size of the ore has not been determined. A rock-raise was also put up from the tenth level to this ore close to the base of the first raise. In the North Deposit one gang is mining floors 1500 feet east of "A" shaft, and another is raising at the east end of the vein, 450 feet further east. Another gang has raised in rock to the seventh level, 1800 feet east of the shaft, in the hanging-wall of the Main Vein.

On the ninth level two contracts have mined backs in the Main Vein from 1000 to 1500 feet east of the shaft, and another contract has mined the floor of the eighth level and put up two raises from 1950 to 2000 feet east of the shaft. Another contract cross-cut 175 feet north in rock to the North Deposit, and is now stoping east and west 1900 feet east of the shaft. In the South-East Deposit one contract has stoped throughout the year 1400 to 1500 feet south-east of the shaft, and another gang drifted south-west 200 feet in rock from the end of the long south cross-cut to the top of a raise put up in ore from the tenth level, 1850 feet south-east of the shaft. The ore here is small.

On the tenth level one contract has been stoping in the South-East Deposit throughout the year 1850 to 1900 feet south-east of the shaft.

One gang has been stoping on the eleventh level, and another on the twelfth level 1200 feet east of the shaft in the Main Vein.

"B" Shaft.

On the 1200 foot sub-level, 100 feet above the first level in the Main Vein, one contract has mined backs throughout the year 500 to 550 feet south of "B" shaft, and another has mined floors further east. This contract is now drifting east in mixed ore on the 1167 foot sub-level. Another contract followed the ore east on the foot-wall 600 feet south of the shaft to Diamond-Drill Hole No. 9, and opened a stope here. They have also cross-cut south on Drill-Hole No. 284, but have found no ore large enough to mine. In the South Lens another gang is mining the floor of the 1200 foot sub-level. At the east end of the Main Vein, 700 feet south-east of "B" shaft, one gang has followed the ore down to the elevation of the second level and made connection with workings from "A" shaft.

On the third level one contract stoped for a few months 300 feet north of "B" shaft and then mined floors 300 feet south-east of "B" shaft for two months. There was no work on the fourth level.

On the fifth level the available ore in the floor 800 feet and further west of the shaft has been finished, and nearly all the floors in the North Deposit have been mined. One gang is still mining floors here, and another has been stoping throughout the year 600 to 700 feet north-west of the shaft.

On the sixth level in the North Deposit the floors in the west end and in the middle of the deposit were mined during the year and one gang is still working here. Part of the floors in the Fault Vein and in the Main Vein 1000 to 1200 feet west of the shaft have also been mined and two gangs are now working here.

On the seventh level in the North Deposit most of the floors in the east end have been mined, and two contracts are now raising here to take down the floor of the sixth level. One gang is also mining floors in the Main Vein 900 feet west of the shaft. They have been working here about six months.

On the eighth level one contract has mined the ore in the back of the Main Vein for 200 feet east from the west end. They have worked only part of the time.

On the ninth level one contract has followed the Main Vein west throughout the year, and are now 1460 feet west of the shaft. The ore is very irregular and not large.

On the tenth level two contracts worked in the Main Vein most of the year. One was mining the ore in the back 700 to 900 feet west of the shaft, and the other was stoping 1300 feet west of the shaft. Both gangs are now on the lower levels. Another contract has been stoping and mining the back in the Fault Vein from 900 to 1050 feet west of the shaft.

On the eleventh level the limits of the ore on the north side of the syncline were reached in the first half year, and some of the floor near the west end has been mined. On the south side one contract has followed the foot-wall west throughout the year, and are now 1450 feet west of the shaft.

The twelfth level has opened up well on the south side, where one contract has been stoping west throughout the year. The north side has been disappointing, as the ore-formation is lean near the hanging-wall. One contract is drifting and another raising on this side.

Work on the thirteenth level has been facilitated by some new raises, which were put up from the fifteenth to the fourteenth, from the fourteenth to the thirteenth, and thence to the twelfth level. Two gangs have been stoping all the year and another during the last six months, and one gang has been drifting west in ore and rock during the last half year. They are now nearly 1800 feet west of the shaft. The outline of the ore on the level is irregular, but as developed has a maximum length of 430 feet and a maximum width of 280 feet. It is about 30 feet high.

The fourteenth level is small, but connects with three raises from the fifteenth level. One stope 100 feet long was opened during the year. One contract is now drifting west in jasper 1480 feet west of the shaft.

The only work done on the fifteenth level is a raise, put up from the west end of the main drift to the fourteenth level.

CLIFFS SHAFT MINE.

COMPARISON OF COST SHEETS FOR 1918 AND 1919.

The Cliffs Shaft Mine worked on single shift in 1918 and 1919, but hoisting was done on both shifts. There was a loss of product of 5,000 tons in August 1919, while "B" shaft was being repaired.

Wages were advanced 10% on April 16th, August 1st and October 1st, 1918, the last scale being maintained in 1919. The average wages in 1919 were therefore 18.4% higher than in 1918.

In 1919 two new air-compressors were installed, two new concrete shaft-houses were built, "B" shaft was retimbered down to water-level, and additional room was graded, plank laid, two trestles built and a haulage plant erected to make room for the winter's production. In addition No. 3 Mine was unwatered down to the first level, a shaft-house was built, and the shaft was retimbered down to water-level. All this construction-work, amounting to $ 117,252.60, was charged out against the ore in 1919. Furthermore, owing to small sales it was necessary to stock crushed ore all summer long, and stocking lump ore in the fall was unusually expensive and slow, before the new trestles were ready, causing a loss of product. As a result costs were considerably higher in 1919 than in 1918. The following tabulation shows the costs of the different items.

(1) New Compressors, E and A. 370.,	$ 38,164.21
(2) New Shaft-Houses, E and A. 379.,	52,137.67
(3) Repairing "B" Shaft,	1,318.39
(4) Pumping Out No. 3 Mine,	13,346.65
(5) New Trestle, Stock-Pile Floor, and Haulage,	12,285.68
Total	$ 117,252.60
(6) Cost of Stocking Ore All Summer,	6,795.61
Total	$ 124,048.21

By deducting the $ 124,048.21 enumerated above from the total cost for 1919 and using the amount thus obtained, the cost per ton for 1919 would be $ 2.130. We must make a further correction of 18.4% of the labor cost for 1918, or $ .238, and, deducting this $ .238, we get a cost of $ 1.892 per ton for 1919 to compare with $ 1.852 for 1918. However, the rock-drifting done in 1919 cost $ .068 more than in 1918, making a real net decrease of $ .028 in 1919.

Production.

	Total Tons	Per Day Tons
Year 1918	373,734	1,254
Year 1919	366,773	1,231
Decrease	6,961	23

Labor.

	Year 1918	Year 1919
Average number of men	336	361
Average rate per day	4.88	5.66

Tons per Man per Day.

	Year 1918	Year 1919
Surface	15.54	11.13
Underground	4.93	4.90
Total	3.74	3.40

Cost of Production.

	Year 1918	Year 1919
Labor	$ 1.291	$ 1.663
Supplies	.561	.806
Total	$ 1.852	$ 2.469

GENERAL EXPENSE.

No. 26 - Insurance.

1918	$ 1163.62	$ .003
1919	1452.33	.004
Increase	$ 288.71	$ .001

The increase is entirely in riot insurance premium.

No. 27 - Engineering.

1918	$ 1908.37	$ .005
1919	2470.81	.007
Increase	$ 562.44	$ .002

This is a Central Office charge. The increase is partly due to higher wages, and partly to more surveying in connection with new construction and development.

No. 28 - Analysis.

1918	$ 2387.27	$ .006
1919	2453.07	.007
Increase	$ 65.80	$ .001

No. 30 - Personal Injury Expense.

1918	$ 10378.08	$ .028
1919	18108.05	.049
Increase	$ 7729.97	$ .021

There were two fatal accidents in 1919 and one in 1918. Charges for the two years were as follows:-

	1918	1919
Medical & Hospital Exp.	$ 1696.29	$ 2004.23
Mutual Settlement	100.00	125.00
Compensation Charges	6822.42	9561.08
½ Day Funeral Expense	575.91	1691.15
Hospital Deficit	1183.46	4726.59
Total	$ 10378.08	$ 18108.05

No. 30a - Mine Office.

1918	$ 11833.36	$ .032
1919	15542.36	.042
Increase	$ 3709.00	$ .010

The increase is due to one extra clerk, $ 1020.00. Increase in wages and Central Office charges.

MAINTENANCE.

No. 125 - Tracks and Yards.

1918	$ 2743.19	$ .007
1919	2546.17	.007
Decrease	$ 197.02	$ .000

The decrease is in cost of maintenance of office grounds, etc., which cost $ 2027.97 in 1918.

No. 126 - Docks, Trestles and Pockets.

1918	$ 1345.72	$ .004
1919	6828.81	.019
Increase	$ 5483.09	$ .015

The increase is in cost of sollar plank, grading and laying, which cost $ 7878.42 in 1919.

No. 127 - Buildings.

1918	$ 4124.69	$ .011
1919	54419.24	.148
Increase	$ 50294.55	$ .137

The increase is in E and A. 379---New concrete shaft-houses, which cost $ 52,137.67 in 1919.

MAINTENANCE. (Continued)

No. 128 - Shop Machinery.

1918	$ 2865.01	$ .008
1919	228.57	.001
Decrease	$ 2636.44	$ .007

In 1918 a new drill-sharpener cost $ 1,389.83, a pedestal grinder cost $ 150, and $ 825.85 was transferred from E and A. 318 to this account.

No. 129 - Boiler Plant.

1918	$ 5936.46	$ .016
1919	2572.72	.007
Decrease	$ 3363.74	$ .009

In 1918 the principal item was E and A. 352, covering a new coal-crusher and elevator, which cost $ 3,565.78.

No. 130 - Hoisting Machinery.

1918	$ 14142.55	$ .038
1919	10866.09	.030
Decrease	$ 3276.46	$ .008

In 1918 the principal items were 12" counter-weight pipe, $ 8,003.16 and counter-weights, $ 1,052.82. In 1919 two new ropes were put on, 450 feet of 12" pipe were charged out, a new bell system was installed and a new rotor was bought for "B" shaft hoist.

No. 131 - Compressors and Power Drills.

1918	$ 1008.92	$ .003
1919	41681.61	.114
Increase	$ 40672.69	$ .111

In 1919 the principal item was E and A. 370, covering two new electric air-compressors, which cost $ 38,164.21, and three new drills cost $ 990, circulation pump and motor cost $ 990, 6" pipe $ 387, and 4" pipe $ 114.

No. 132 - Pumping Machinery.

1918	$ 1612.39	$ .004
1919	10252.42	.028
Increase	$ 8640.03	$ .024

The principal items in 1919 were maintenance and installation charges for pumping out No. 3 shaft, amounting to $ 5,912.53, 2 pump cables $ 2,327, and an oil circuit breaker $ 298.

No. 133 - Top Tram Engines and Cars.

1918	$ 2992.52	$ .008
1919	2447.51	.007
Decrease	$ 545.01	$ .001

In 1918 Hard Ore Shop charges were $ 600 for a new car.

No. 134 - Skips and Skip-Roads.

1918	$ 2915.78	$ .008
1919	2713.31	.007
Decrease	$ 202.47	$ .001

Charges for both years are a little high on account of repairs to skip-roads. This was particularly true in 1918.

No. 135 - Underground Tracks and Cars.

1918	$ 11061.96	$ .030
1919	14727.13	.040
Increase	$ 3665.17	$ .010

The increase is in labor on tracks and maintenance of cars, rail being nearly the same for both years.

No. 136 - Electric Tram Plant.

1918	$ 6868.42	$ .018
1919	6028.76	.016
Decrease	$ 839.66	$ .002

In 1918 a cable cost $ 1,545.

MAINTENANCE. (Continued)

No. 137 - Telephones and Safety Devices.

1918	$ 2315.56	$ .006
1919	4574.74	.012
Increase	$ 2259.18	$ .006

The increase is mostly due to the new cable and connections for telephones, lights, etc., for which the principal supply items slightly exceeded $ 2,000.

No. 138 - Crushing and Screening.

1918	$ 4575.32	$ .012
1919	3010.00	.008
Decrease	$ 1565.32	$ .004

In 1918 sectional plates cost $ 580 and chute plates $ 200. The principal charges in 1919 have been for plates in the chutes. The main shaft of the big crusher broke in June.

Underground Shovel and Gas Car.

1918	$ 497.98	$ .001
1919	1020.81	.003
Increase	$ 522.83	$ .002

A second gas locomotive was put in use late in 1918, and on this locomotive the repairs have been high. The shovel was not operated during the second half of 1919, but it was thoroughly overhauled and extensive repairs made.

MINING EXPENSE.

No. 150 - Air-Pipes.

1918	$ 5789.63	$ .015
1919	5376.44	.015
Decrease	$ 413.19	$ .000

The decrease is in amount of pipe used.

No. 151 - Compressors.

1918	$ 33945.78	$ .091
1919	38376.68	.105
Increase	$ 4430.90	$ .014

In 1919 most of the air was made by electricity, with consequently greater cost to the mine.

No. 152 - Hoisting.

1918	$ 19491.47	$ .052
1919	20189.09	.055
Increase	$ 697.62	$ .003

The increase is due to higher wages in 1919.

No. 153 - Pumping.

1918	$ 22399.12	$ .060
1919	22814.96	.062
Increase	$ 415.84	$ .002

The increase is due to higher wages and more power used.

No. 154 - Sinking and Shaft Repairs.

1918	$ 4411.66	$ .012
1919	5331.59	.015
Increase	$ 919.93	$ .003

The increase is due to repairing "B" shaft.

No. 155 - Rock Drifting.

1918	$ 41147.91	$ .110
1919	65439.35	.178
Increase	$ 24291.44	$ .068

There was 2,217 feet of drifting in 1918 and 3,362 feet in 1919.

MINING EXPENSE. (Continued)

No. 156 - Breaking Ore.

1918	$ 234384.40	$ .627
1919	234774.65	.640
Increase	$ 390.25	$ .013

The increase in cost per ton is due to average higher wages and to a smaller proportion of contracts mining floors and backs in 1919.

No. 157 - Tramming.

1918	$ 172715.04	$ .462
1919	204336.01	.557
Increase	$ 31620.97	$ .095

The increase is due to 18.4% higher wages in 1919.

No. 158 - Filling.

1918	$ 5704.27	$ .015
1919	6257.73	.017
Increase	$ 553.46	$ .002

There was much more rock handled in 1919.

No. 159 - Timbering.

1918	$ 4663.46	$ .012
1919	4382.18	.012
Decrease	$ 281.28	$ .000

In 1919 some of the timbermens' time was charged to repairing "B" shaft.

No. 160 - Captain and Bosses.

1918	$ 14097.77	$ .038
1919	16172.47	.044
Increase	$ 2074.70	$ .006

The increase is due to 18.4% higher wages in 1919.

No. 161 - Dry-House.

1918	$ 4030.20	$ .011
1919	6816.10	.019
Increase	$ 2785.90	$ .008

The increase is due to 18.4% higher wages in 1919 and to a re-adjustment of proportion of boiler-house expense.

No. 162 - Top Landing and Tramming.

1918	$ 9034.49	$ .024
1919	11068.66	.030
Increase	$ 2034.17	$ .006

There was one more lander in 1919 than during the first half of 1918. The balance is due to higher wages.

No. 163 - Stocking Ore.

1918	$ 9260.98	$ .025
1919	27021.28	.074
Increase	$ 17760.30	$ .049

An increase of $ 1,361 is due to higher wages, and small shipments caused an increase in cost of stocking ore in the summer. The new trestle, etc. cost $ 12,285.68.

No. 164 - Sorting Ore.

1918	$ 8915.14	$ .024
1919	10006.40	.027
Increase	$ 1091.26	$ .003

The increase is due to 18.4% higher wages in 1919.

No. 166 - Cave-In.

1918	$	$
1919	6.04	.000
Increase	$ 6.04	$ .000

MINING EXPENSE. (Continued)

No. 168 - Crushing and Screening.

1918	$ 9696.92	$ .026
1919	15721.54	.043
Increase	$ 6024.62	$ .017

$ 1,425 of the increase is due to higher wages, and the balance to stocking crushed ore all summer.

Pumping No. 3 Mine.

1918	$	$
1919	7434.12	.020
Increase	$ 7434.12	$ .020

No. 3 Mine was pumped out to the first level in 1919.

RECAPITULATION.

	Year 1918		Year 1919		Increase		Decrease	
	Total	Per Ton	Total	Per Ton	Total	Per Ton	Total	Per Ton
General Expense	27670.70	.074	40026.62	.109	12355.92	.035		
Maintenance	65006.47	.174	163917.89	.447	98911.42	.273		
Mining Expense	599688.24	1.604	701525.29	1.913	101837.05	.309		
Cost of Production	692365.41	1.852	905469.80	2.469	213104.39	.617		

CLIFFS SHAFT MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR - 1919.

GRADE	IRON	PHOS.
Cliffs Shaft Lump,	59.04	.104
Cliffs Shaft Crushed,	57.63	.105

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR - 1919.

GRADE	Mine		Lake Erie	
	IRON	PHOS.	IRON	MOIST.
Cliffs Shaft Lump,	59.49	.103	59.50	.59
Cliffs Shaft Crushed,	56.89	.106	58.40	1.40

ORE STATEMENT - DECEMBER 31ST, 1919.

	CL. SHAFT LUMP	CL. SHAFT CRUSHED	TOTAL	TOTAL LAST YEAR
On hand Jan. 1st, 1919,	73,703	28,059	101,762	60,838
Output for year,	211,962	154,811	366,773	373,734
Total,	285,665	182,870	468,535	434,572
Shipments,	95,473	1,661	97,134	332,810
Balance on hand,	190,192	181,209	371,401	101,762
Decrease in Output-2%			6,961	
Increase in ore on hand,			269,639	

1919 - 1-8 Hour Shift for year

1918 - 1-8 Hour Shift for year.

CLIFFS SHAFT MINE.

CLIFFS SHAFT MINE

SHIPMENTS FOR YEAR - 1919.

GRADE	POCKET	STOCKPILE	TOTAL	TOTAL LAST YEAR
Lump Cliffs Shaft,	83,755	11,718	95,473	225,417
Crushed Cliffs Shaft,	1,661		1,661	107,393
Total,	85,416	11,718	97,134	332,810
Total last Year,	217,073	115,737	332,810	348,890
Decrease - 71%			235,676	16,080

Tonnage mined from the former Cleveland Iron Mining Company's property through the Cliffs Shaft Mine during 1919,.... 8,613.

CLIFFS SHAFT MINE.

CLIFFS SHAFT MINE.

COMPARATIVE MINING COST FOR YEAR.

	1 9 1 9.	1 9 1 8.	INCREASE.	DECREASE.
PRODUCT	366,773	373,734		6,961
General Expense	.109	.074	.035	
Maintenance	.447	.174	.273	
Mining Expense	1.913	1.604	.309	
Cost of Production	2,469	1.852	.617	
Exploratory	.027	.013	.014	
DEPRECIATION.				
Original Purchase	.249	.249	-	
Plant Account	.021	.012	.009	
Equipment	.003	.004		.001
Construction	-	.010		.010
Total Depreciation	.273	.275		.002
Taxes	.268	.175	.093	
Central Office	.070	.074		.004
Supply Inventory	-	.017		.017
Miscellaneous	.003	.003		
Sundry Expense	.007	.036		.029
Cost on Stockpile	3.117	2.445	.672	
Loading & Shipping	.018	.047		.029
Total Cost on Cars	3.135	2.492	.643	
No.Days Operating	298	298		
No.Shifts & Hours	1-8hr	1-8hr		
Avg.Daily Product	1,231	1,254		23
COST OF PRODUCTION.				
Labor	1.663	1.291	.372	
Supplies	.806	.561	.245	
Total	2.469	1.852	.617	

CLIFFS SHAFT MINE.

COMPARATIVE WAGES AND PRODUCT.

	1 9 1 9.	1 9 1 8.	INCREASE.	DECREASE.
PRODUCT	366,773	373,734		6,961
No.Shifts and Hours	1-8hr	1-8hr		
AVERAGE NUMBER MEN WORKING				
Surface	110	81	29	
Underground	251	254		3
Total	361	335	26	
AVERAGE WAGES PER DAY				
Surface	4.95	4.21	.74-17.6%	
Underground	5.98	5.10	.88-17.3%	
Total	5.66	4.88	.78-16 %	
WAGES PER MONTH OF 25 DAYS				
Surface	123.75	105.24	18.50	
Underground	149.50	127.50	22.00	
Total	141.50	122.00	19.50	
PRODUCT PER MAN PER DAY				
Surface	11.13	15.54		4.41
Underground	4.90	4.93		.03
Total	3.40	3.74		
LABOR COST PER TON				
Surface	.445	.271	.174	
Underground	1.221	1.034	.187	
Total	1.666	1.305	.361-27.6%	
AVG. PRODUCT BRK'G & TRM'G	6.38	6.27	.11	
" WAGES CONTRACT MINERS	5.80	5.75	1.05	
" " " TRAMMERS	6.92	4.90	2.02	
" " " LABOR	6.24	5.26	.98	
TOTAL NUMBER OF DAYS				
Surface	32,943½	24,049¾	8,893¾	
Underground	74,909½	75,795¼		886
Total	107,853	99,845¼	8,007¾	
AMOUNT FOR LABOR				
Surface	163102.95	101375.03	61727.92	
Underground	447812.75	386253.55	61559.20	
Total	610915.70	487,628.58	123287.22	

Proportion Surface to Underground Men:

1919 - 1 to 2.30
1918 - 1 to 3.14
1917 - 1 to 3.25
1916 - 1 to 3.87
1915 - 1 to 3.76
1914 - 1 to 3.59

CLIFFS SHAFT MINE.

STATEMENT OF EXPLOSIVES USED FOR BREAKING ORE.

KIND.	QUANTITY.	AVERAGE PRICES.	AMOUNT 1 9 1 9.	AMOUNT 1 9 1 8.
50% Powder	274,760	.1801½	49496.68	55681.27
Blk. "	10	1.90	19.00	
Total Powder	274,770	18.02	49515.68	55681.27
Fuse	363,220	7.65	2779.27	2804.97
Caps	83,715	14.24	1192.18	1275.54
Cap Crimpers	32	.50	16.00	3.80
Total Fuse, Etc.			3987.45	4084.31
Total All Explosives			53503.13	59765.58
Product			366,773	373,734
Pounds Powder per ton of Ore			.749	.715
Cost per ton for Powder			.1350	.1490
" Fuse, Caps, Etc.			.0109	.0109
" All Explosives			.1459	.1599
Avg. Price per Lb. for Powder			.1801½	.2080

ANNUAL REPORT

OF THE

SALISBURY MINE (1919)

Production and Shipments.

The Salisbury Mine worked 298 days in 1919, and produced 107,148 tons of ore of all grades, an average of 359 tons per day. More than three times as much work was done in rock in 1919 as in 1918, but no new ore was found, and operations were confined mostly to stoping. 8,626 tons of rock were hoisted, an average of 29 tons per day.

Most of the Clinton and Silica stock-piles were shipped.

Table I.

Production by Grades.

Grade	Total for Year		Average per Day	
	1919 Tons	1918 Tons	1919 Tons	1918 Tons
Bessemer	158	3,167	1	11
Clinton	51,061	68,588	171	230
Clinton Silica	55,929	42,584	187	142
Total Ore	107,148	114,339	359	383
Rock	8,626	2,358	29	8
Total Ore and Rock	115,774	116,697	388	391

Table II.

Shipments.

Grade	Pocket Tons	Stock-Pile Tons	Total Tons
Clinton	11,889	39,672	51,561
Clinton Silica	13,079	42,335	55,414
Total	24,968	82,007	106,975

Table III.

Stock-Pile Balances, December 31st, 1919.

Grade	1919 Tons	1918 Tons
Bessemer	756	598
Clinton	6,750	7,250
Clinton Silica	41,156	40,641
Total	48,662	48,489

Table IV.

Division of Product by Levels.

Level	Bessemer Tons	Clinton Tons	Clinton Silica Tons	Total Ore Tons	Rock Tons	Total Ore and Rock Tons
5		542	6,227	6,769	40	6,809
8	58	6,684	40,602	47,344	1,864	49,208
10	62	3,967	4,772	8,801	198	8,999
11		4,486	2,085	6,571	48	6,619
12	38	34,612	2,067	36,717	940	37,657
14		62	46	108	2,690	2,798
15		708	130	838	2,846	3,684
Total	158	51,061	55,929	107,148	8,626	115,774

Table V.

Production by Months.

Month	Days	Ore Per Day Tons	Bessemer Tons	Clinton Tons	Clinton Silica Tons	Total Ore Tons	Rock Tons	Total Ore and Rock Tons
January	26	344	18	4,890	4,051	8,959	594	9,553
February	23	386	40	5,368	3,475	8,883	518	9,401
March	26	370	100	4,963	4,554	9,617	632	10,249
April	24	343		3,526	4,720	8,246	962	9,208
May	25	325		3,248	4,880	8,128	1,026	9,154
June	24	357		3,783	4,786	8,569	710	9,279
July	24	361		5,079	3,592	8,671	766	9,437
August	26	356		4,668	4,591	9,259	442	9,701
September	25	363		4,369	4,707	9,076	492	9,568
October	27	386		4,400	6,032	10,432	540	10,972
November	24	379		3,859	5,227	9,086	700	9,786
December	24	343		2,908	5,314	8,222	1,244	9,466
Year	298	359	158	51,061	55,929	107,148	8,626	115,774

Table VI.

Delays.

Date	Hours	Tons Lost	Cause	Repair Cost
Jan. 8	3	50	Skip off the track at the knuckle.	$ 12.05
" 9	13	300	Skip off the track at the knuckle.	43.45
" 10	12	350	Repairing shaft at the knuckle.	70.92
" 11	6	200	Repairing shaft at the knuckle.	23.40
Apr. 4	4	80	Broken runner in shaft.	20.62
Sept. 20	2	50	No current.	
Oct. 17	2	50	Broken bolt on clutch of cage-hoist.	6.04
Nov. 17	3	70	Broken rail at knuckle.	36.48
Dec. 11	3	70	Skip off the track at the knuckle.	18.96
" 12	8	200	Skip off the track at the knuckle. Cutting ice.	49.45
" 19	2	50	Skip off the track at the knuckle. Broken axle.	14.60
Total	58	1,470		$ 295.97

Table VII.

Estimate of Ore Reserves.

Developed Ore.

Level	Bessemer Tons	Clinton Tons	Clinton Silica Tons	Total Tons
Third			2,000	2,000
Fourth			5,000	5,000
Fifth			12,000	12,000
Eighth			12,000	12,000
Ninth		8,000	11,000	19,000
Tenth		5,000	14,000	19,000
Eleventh		3,000	18,000	21,000
Twelfth		20,000	7,000	27,000
Thirteenth	6,000	42,000		48,000
Fourteenth	5,000	28,000		33,000
Fifteenth		11,000		11,000
Sixteenth	3,000	1,000	9,000	13,000
Total	14,000	118,000	90,000	222,000
Less 10% Rock and 10% Loss in Mining	3,000	23,000	18,000	44,000
Net Total	11,000	95,000	72,000	178,000

Factors Used:- Bessemer and Clinton, 10 cu. ft. per ton.

Clinton Silica, 13-15 cu. ft. per ton.

SURFACE.

There was no new construction work carried on during the year, and nearly all work on surface was in the regular routine.

The Clinton stock-pile was nearly all shipped, and a large tonnage was shipped from the Clinton Silica pile, but no shipments were made from the Bessemer pile, which is very small.

The ditch carrying the overflow from Lake Sally around the South-East Deposit was thoroughly cleaned out.

UNDERGROUND.

There were no new discoveries of ore during the year, and operations were confined to stoping, except for some rock-drifting on the ninth level in the old mine and on the fourteenth and fifteenth levels in the South-East Deposit.

On the fifth level two contracts were stoping in the North Vein in December. One had worked in No. 2 shaft pillar throughout the year, and the other has been stoping 1,000 feet south-east of the shaft for three months.

On the eighth level all the ore in the Bessemer Deposit and most of that near the east end of the Foot-Wall Deposit, and all the ore remaining above the level in the South Vein has been mined. There are four gangs working on the eighth level.

Two gangs are scramming on the north side of the South Vein on the 1100 foot sub-level and another is scramming near the south foot-wall on the 1000 foot sub-level at the east end of the vein. The first two gangs have worked here the whole year, and the third one for about six months.

On the 1045 foot sub-level, or ninth level, a cross-cut was driven north 135 feet in diorite through the foot-wall of the South Vein to the North Vein, and a drift was then driven east in the North Vein for 200 feet in diorite. From the end of this drift a raise is being put up to mine the ore in the floor of the eighth level in the Bessemer Deposit.

Both the eighth and twelfth levels in the old mine were retimbered.

In the South-East Deposit the ore left above the eleventh level and all the ore down to within 20 feet of the twelfth level has been mined. A new sub-level at 940 feet, 10 feet above the twelfth level, is being opened. Seven gangs are working in this deposit. On the fourteenth level 60 feet of rock-drifting was done to facilitate the handling of loaded cars, and the south cross-cut was extended 75 feet in rock to explore the formation.

The winze called No. 8 shaft below the fourteenth level in the South-East Deposit was continued in rock 62 feet to the fifteenth level, and the fifteenth level opened. This level was opened for a length of 270 feet in rock, and two cross-cuts 70 feet long were driven to the south, and one 50 feet long to the north-east. This last one cut a vein of ore seven feet wide, which was followed east for 70 feet. A little other ore was found in the back, but did not extend down to the floor of the level.

There were seventeen contracts working throughout the year, of which ten were in the old mine and seven in the South-East Deposit.

SALISBURY MINE.

COMPARISON OF COST SHEETS FOR 1918 AND 1919.

The Salisbury Mine worked on double shift throughout both 1918 and 1919, and there was little change in the method of mining. There was much more rock-work done in 1919.

Wages were increased 10% successively on April 16th, August 1st, and October 1st, 1918, and the last rate was maintained without change in 1919, making 1919 wages 18.4% higher than the average for 1918.

Production.

	Total	Per Day
Year 1918	114,339 Tons	383 Tons
Year 1919	107,148 "	361 "
Decrease	7,191 "	22 "

Labor.

	1918	1919
Average number of men	124	127
Average rate per day	$ 4.82	$ 5.56

Tons per Man per Day.

	1918	1919
Surface	12.19	12.02
Underground	3.95	3.69
Total	2.98	2.82

Cost of Production.

	1918	1919
Labor	$ 1.560	$ 1.976
Supplies	.574	.618
Total	$ 2.134	$ 2.594

Deducting 18.4% of the 1918 labor cost from the 1919 labor cost, gives $ 1.689 to compare with $ 1.560, an increase of $ .129 in labor. The supply increase is $ .044, making a total of $ .173. Rock-drifting increased $ .119 and shaft repairs $ .013, leaving a net increase of $ .041 in the other accounts.

GENERAL EXPENSE.

No. 26 - Insurance.

1918	$ 419.12	$ .003
1919	591.92	.006
Increase	$ 172.80	$ .003

Riot insurance increased $ 184 in 1919.

No. 27 - Engineering.

1918	$ 796.94	$ .007
1919	1063.83	.010
Increase	$ 266.89	$ .003

The increase is due to opening the fifteenth level in No. 8 shaft and to drifting on the ninth level. This is a Central Office charge.

No. 28 - Analysis.

1918	$ 4328.25	$ .038
1919	4816.63	.045
Increase	$ 488.38	$ .007

The increase is due to higher costs at Central Laboratory.

No. 30 - Personal Injury Expense.

1918	$ 7288.82	$ .064
1919	3360.16	.031
Decrease	$ 3928.66	$ .033

This is a Central Office charge. In 1918 there were two fatal accidents and none in 1919. Items of expense in 1918 and 1919 were as follows:-

	1918	1919
Medical & Hospital Exp.	$ 607.41	$ 671.20
Compensation Charges	6233.34	554.35
½ Day Wages for Funeral		411.88
Hospital Deficit	448.07	1722.73
Total	$ 7288.82	$ 3360.16

No. 30a - Mine Office.

1918	$ 6631.02	$ .058
1919	7611.80	.071
Increase	$ 980.78	$ .013

Wages increased $ 860, office equipment and maintenance $ 75, exchange $ 25 and first aid $ 20.

MAINTENANCE.

No. 125 - Tracks and Yards.

1918	$ 926.23	$ .008
1919	1912.45	.018
Increase	$ 986.22	$ .010

Cleaning out the ditch below Lake Sally in 1919 caused the increase. This was not done in 1918, and the ditch was in bad shape.

No. 126 - Docks, Trestles and Pockets.

1918	$ 426.93	$ .004
1919	213.09	.002
Decrease	$ 213.84	$ .002

In 1918 the skip wrecked the pocket, and these repairs caused the higher cost in that year.

No. 127 - Buildings.

1918	$ 898.11	$ .008
1919	243.69	.002
Decrease	$ 654.42	$ .006

In 1918 a sample-house cost $ 56, coal-dock repairs $ 46, office repairs $ 63 and interior repairs to engine-house $ 470.

No. 128 - Shop Machinery.

1918	$ 98.69	$ .001
1919		
Decrease	$ 98.69	$ .001

No. 129 - Boiler Plant.

1918	$ 122.27	$ .001
1919	.21	.000
Decrease	$ 122.06	$ .001

1918 charges were for general boiler repairs.

No. 130 - Hoisting Machinery.

1918	$ 4516.46	$ .039
1919	2908.15	.027
Decrease	$ 1608.31	$ .012

Depreciation charges decreased $ 2103.49 in 1919. The increase is due to new motor for the hoist.

No. 131 - Compressors and Power Drills.

1918	$ 1338.12	$ .012
1919	1369.22	.013
Increase	$ 31.10	$ .001

No. 132 - Pumping Machinery.

1918	$ 3441.18	$ .030
1919	2148.32	.020
Decrease	$ 1292.86	$ .010

Depreciation decreased $ 2628.56 in 1919. The principal charges in 1919 were for repairs to the centrifugal pump and to the water-column.

No. 133 - Top Tram Engines and Cars.

1918	$ 306.86	$ .003
1919	465.80	.004
Increase	$ 158.94	$ .001

1919 charges were mostly for repairs to top tram engine and wheels and axles for cars.

No. 134 - Skips and Skip-Roads.

1918	$ 2265.27	$ .020
1919	1709.21	.016
Decrease	$ 556.06	$ .004

There were practically no repairs to the cage in 1919, which in 1918 cost $ 180. Repairs to skips cost $ 523 in 1918. There was a decrease in these repairs and in repairs to the skip-road in 1919.

MAINTENANCE. (Continued)

No. 135 - Underground Tracks and Cars.

In 1919 an extra man was put on cleaning tracks and ditches.

1918	$ 3106.85	$ .027
1919	3945.39	.037
Increase	$ 838.54	$ .010

No. 137 - Telephones and Safety Devices.

Lighting shafts and levels cost $ 80 more in 1919 and First Aid work $ 30 more.

1918	$ 337.99	$ .003
1919	441.29	.004
Increase	$ 103.30	$ .001

MINING EXPENSE.

No. 150 - Air-Pipes.

1918	$ 906.08	$ .008
1919	996.56	.009
Increase	$ 90.48	$ .001

No. 151 - Compressors.

The increase is due to higher wages and more current used.

1918	$ 6724.64	$ .059
1919	8646.00	.081
Increase	$ 1921.36	$ .022

No. 152 - Hoisting.

The increase is mostly due to 18.4% higher wages.

1918	$ 11100.25	$ .097
1919	12274.05	.115
Increase	$ 1173.80	$ .018

No. 153 - Pumping.

The increase is due to higher wages and to more pumping due to heavy run-off in spring of 1919. A rearrangement of pumping-hours also added to the labor cost.

1918	$ 6709.24	$ .059
1919	10838.82	.101
Increase	$ 4129.58	$ .042

No. 154 - Sinking and Shaft Repairs.

Charges for both years are mostly for repairs to the knuckle.

1918	$ 2462.87	$ .021
1919	3626.94	.034
Increase	$ 1164.07	$ .013

No. 155 - Rock Drifting.

Rock drifting increased from 218 feet in 1918 to 1,260 feet in 1919.

1918	$ 1768.78	$ .015
1919	14358.32	.134
Increase	$ 12589.54	$ .119

No. 156 - Breaking Ore.

The increase is due to higher wages.

1918	$ 97289.87	$ .851
1919	102839.53	.960
Increase	$ 5549.66	$ .109

MINING EXPENSE. (Continued)

No. 157 - Tramming.

1918	$ 27729.90	$ .242
1919	30821.57	.288
Increase	$ 3091.67	$ .046

The increase is due to higher wages.

No. 158 - Filling.

1918	$	$
1919	541.81	.005
Increase	$ 541.81	$ .005

1919 charges are for filling an old room on the ninth level.

No. 159 - Timbering.

1918	$ 28780.24	$ .252
1919	31829.63	.297
Increase	$ 3049.39	$ .045

The increase is due to the higher rate of wages and higher cost of timber in 1919.

No. 160 - Captain and Bosses.

1918	$ 9235.91	$ .081
1919	10988.77	.103
Increase	$ 1752.86	$ .022

The increase is due to the higher rate of wages.

No. 161 - Dry-House.

1918	$ 3628.54	$ .032
1919	4308.85	.040
Increase	$ 680.31	$ .008

The increase is due to higher wages in 1919.

No. 162 - Top Landing and Tramming.

1918	$ 7938.25	$ .070
1919	9980.29	.093
Increase	$ 2042.04	$ .023

There was a decrease of 2,300 tons in pocket shipments in 1919.

No. 163 - Stocking Ore.

1918	$ 1161.01	$ .010
1919	1991.66	.018
Increase	$ 830.65	$ .008

Stocking trestles were taken down and put up again twice in 1919 on account of the dock-mens' strike in August.

No. 166 - Cave-In.

1918	$ 216.13	$ .002
1919	230.40	.002
Increase	$ 14.27	$ .000

No. 171 - Ventilation.

1918	$ 1022.67	$ .009
1919	882.69	.008
Decrease	$ 139.98	$ .001

There was less power used in 1919.

RECAPITULATION.

	Year 1918		Year 1919		Increase		Decrease	
	Total	Per Ton	Total	Per Ton	Total	Per Ton	Total	Per Ton
General Expense	19464.15	.170	17444.34	.163			2019.81	.007
Maintenance	17784.96	.156	15356.82	.143			2428.14	.013
Mining Expense	206674.38	1.808	245155.89	2.288	38481.51	.480		
Cost of Production	243923.49	2.134	277957.05	2.594	34033.56	.460		

SALISBURY MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR 1919.

GRADE	IRON	PHOS.	SILICA
Salisbury Bessemer,	61.48	.067	7.27
Clinton,	60.34	.074	6.30
Clinton Silica,	50.53	.071	21.59

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR 1919.

GRADE	Mine		Lake Erie	
	IRON	PHOS.	IRON	MOIST.
Salisbury Bessemer,	All Mixed			
Clinton,	60.36	.073	59.72	14.27
Clinton Silica,	51.44	.073	50.31	11.85

ORE STATEMENT - DECEMBER 31ST, 1919.

	SALISBURY BESSEMER	CLINTON	CLINTON SILICA	TOTAL	TOTAL LAST YEAR
On hand Jan. 1st,1919,	598	7,250	40,641	48,489	155,953
Output for year,	158	51,061	55,929	107,148	110,715
Stockpile Overrun,					3,624
Total,	756	58,311	96,570	155,637	270,292
Shipments,		51,561	55,414	106,975	221,803
Balance on hand,	756	6,750	41,156	48,662	48,489
Decrease in output-3%				3,567	
Increase in ore on hand,				173	

1919 - 2-8 Hour Shifts for year

1918 - 2-8 Hour Shifts for year

SALISBURY MINE.

SALISBURY MINE

SHIPMENTS FOR YEAR - 1919.

GRADE	POCKET	STOCKPILE	TOTAL	TOTAL LAST YEAR
Salisbury Bessemer,				3,735
Clinton,	11,889	39,672	51,561	82,931
Clinton Silica,	13,081	42,333	55,414	135,137
Total,	24,970	82,005	106,975	221,803
Total last year,	47,363	174,340	221,803	
Decrease - 52%			114,828	

SALISBURY MINE.

SALISBURY MINE.

COMPARATIVE MINING COST FOR YEAR.

	1 9 1 9.	1 9 1 8.	INCREASE.	DECREASE.
PRODUCT	107,148	114,339		7,191
General Expense	.163	.170		.007
Maintenance	.143	.156		.013
Mining Expense	2.288	1.808	.480	
Cost of Production	2.594	2.134	.460	
Exploratory	-	.004		.004
DEPRECIATION.				
Original Purchase	.021	.073		.052
Equipment	.006	.012		.006
Construction	-	-		
Total Depreciation	.027	.085		.058
Taxes	.057	.077		.020
Central Office	.083	.089		.006
Supply Inventory	-	.026		.026
Miscellaneous	.003	.002	.001	
Sundry Expense	.007	.033		.026
Cost on Stockpile		2.450	.321	
Loading & Shipping	.135	.161		.026
Total Cost on Cars	2.906	2.611	.295	
No.Days Operating	297	298		1
No.Shifts & Hours	2-8hr	2-8hr		
Avg. Daily Product	361	384		3
COST OF PRODUCTION.				
Labor	1.976	1.560	.416	
Supplies	.618	.574	.044	
Total	2.594	2.134	.460	

SALISBURY MINE.

COMPARATIVE WAGES AND PRODUCT.

	1 9 1 9.	1 9 1 8.	INCREASE.	DECREASE.
PRODUCT	107,148	114,339		7,191
No.Shifts and Hours	2-8hr	2-8hr		
AVERAGE NUMBER MEN WORKING				
Surface	30	30		
Underground	97	94	3	
Total	127	124	3	
AVERAGE WAGES PER DAY				
Surface	4.98	4.26	.72-17%	
Underground	5.74	5.00	.74-14.8%	
Total	5.56	4.82	.74-15.4%	
WAGES PER MONTH OF 25 DAYS				
Surface	124.50	106.50	18.00	
Underground	143.50	125.00	18.50	
Total	139.00	120.50	18.50	
PRODUCT PER MAN PER DAY				
Surface	12.02	12.59		.57
Underground	3.69	4.08		.39
Total	2.82	3.08		.26
LABOR COST PER TON				
Surface	.415	.339	.076	
Underground	1.556	1.225	.331	
Total	1.971	1.564	.407-26%	
AVG.PRODUCT BRK'G & TRM'G	5.34	5.88	[illegible]	.54
" WAGES CONTRACT MINERS	6.01	5.17	.84	
" " " TRAMMERS	0	4.32	-	
" " " LABOR	6.01	4.97	1.04	
TOTAL NUMBER OF DAYS				
Surface	8,913	9,079½		166½
Underground	29,035½	28,008½	1,027	
Total	37,948½	37,088	860½	
AMOUNT FOR LABOR				
Surface	44423.23	38710.61	5712.62	
Underground	166711.28	140085.06	26626.22	
Total	211134.51	178795.67	32338.84	

PROPORTION Surface to Underground Men:

1919 - 1 to 3.23
1918 - 1 to 3.13
1917 - 1 to 2.68
1916 - 1 to 2.42
1915 - 1 to 2.

SALISBURY MINE.

TIMBER STATEMENT FOR YEAR ENDING DECEMBER 31, 1919.

KIND.	LINEAL FEET.	AVG.PRICE PER FOOT.	AMOUNT 1 9 1 9.	AMOUNT 1 9 1 8.
4" to 6" Timber				145.03
6" to 8" "	23,880	.02	477.60	452.76
8" to 10" "	46,796	.03992	1868.37	2036.79
10" to 12" "	12,104	.06	726.24	1449.28
12" to 14" "	4,296	.08197	352.14	307.77
Total - 1919	87,076	.0393	3424.35	4391.63
Total - 1918	93,705	.047	4391.63	4833.43
	LINEAL FEET.	PER 100'.		
5' Lagging	316,837	.908	2876.60	2101.30
7' "	124,890	.882	1101.26	607.45
Total Lagging	441,727	.905	3977.86	2708.75
Poles	138,340	1.31	1810.15	1515.55
Total - 1919	580,067	.997	5788.01	
Total - 1918	570,499	.74		4224.30

Product		107,142	111,282
Feet Timber per ton of ore		.813	.842
Feet Lagging "		4.123	3.724
Feet Lagging per Foot of Timber		5.079	4.423
Cost per ton for Timber		.0319	.0394
" Lagging		.0371	.0243
" Poles		.0168	.0136
" Timber, Lagging & Poles		.0859	.0774
Equivalent of stull timber to Bd.Measure		143,137	175,041
Ft.Bd.Measure per ton of ore		1.335	1.57
Total Cost for Timber, Lagging & Poles -	1919		9212.36
"	1918		8615.93
"	1917		8213.84
"	1916		6932.89
"	1915		2099.17
"	1914		8127.18
"	1913		7058.47

SALISBURY MINE.

STATEMENT OF EXPLOSIVES USED FOR BREAKING ORE.

KIND.	QUANTITY.	AVERAGE PRICES.	AMOUNT 1 9 1 9.	AMOUNT 1 9 1 8.
40% Powder, 1½" E.F.Standard	13,850	.1686	2335.34	1030.21
50% " "	18,900	.1791	3386.70	6121.70
50% " 1" "	150	.1740	26.10	
50% " 1¼" "	400	.1740	69.60	
Total Powder	33,300	.1747	5817.74	7151.91
Fuse	106,000	78.98	837.27	874.57
Caps	28,775	14.21	408.95	414.39
Cap Crimpers	11	.34	3.73	.32
Total Fuse, Etc.			1249.95	1289.28
Total Explosives			7067.69	8441.19
Product			107,142	111,282
Pounds Powder per ton of Ore			.322	.316
Cost per ton for Powder			.055	.064
" Fuse, Etc.			.011	.011
" All Explosives,			.066	.075
Avg. Price per Lb. for Powder			.1747	.2032

ANNUAL REPORT

OF THE

ANGELINE MINE (1919)

Production and Shipments.

Shipments were made from the East End pit, the Happy Hollow Pit and from "D" Shaft in 1919. The East End Pit was operated during the winter months early in the year, the ore being stocked close to the pit. All ore in stock and all remaining in the pit was shipped during the first half of the season, work being completed at this pit in August.

The Happy Hollow Pit was cleaned out and the ore remaining in the bottom on the north side of the dike was mined in the winter and early spring, but in April the pit, raises and tunnel were filled with quicksand during heavy rains, and no further work was done until September. During the dry fall 1,812 tons were mined by contract, hauled by team to "D" Shaft, and dumped on the stocking floors. Nearly all the ore left on the south side of the dike and under the dam was mined in this way.

The track east of No. 56 timber raise, which is 1,000 feet east of "D" Shaft, was removed by the L. S. & I. Ry. All track now at the mine belongs to the Cleveland-Cliffs Iron Company.

Work at "D" Shaft was started in 1918 in No. 56 pillar, and was continued throughout 1919, production being gradually increased. Very little ore was hoisted from the seventh level.

The mine worked 298 days during the year, and produced 42,080 tons of all grades, an average of 141 tons per day.

Table I.

Production by Grades.

Grade	East End Tons	Happy Hollow Tons	"D" Shaft Tons	Total 1919 Tons	Total 1918 Tons
Angeline Bessemer		1,528	13,467	14,995	7,504
East End Bessemer	13,878			13,878	49,799
Angeline		1,523	8,459	9,982	136
Angeline Silica			3,198	3,198	
Hard Ore			27	27	
Total	13,878	3,051	25,151	42,080	57,439

Table II.

Comparison of Product for 1919 and 1918.

	1919	1918
Days Worked	298	
Ore, Tons	42,080	57,439
Rock, Tons	6,484	
Ore and Rock, Tons	48,564	
Ore per Day, Tons	141	
Rock per Day, Tons	22	
Ore and Rock per Day, Tons	163	

Table III.

Production by Months.

Month	Days	Ore per Day Tons	Angeline Bessemer Tons	Angeline Tons	Angeline Silica Tons	Hard Ore Bessemer Tons	Total Ore Tons	Rock Tons	Total Ore and Rock Tons
January	26	192	4,962	20			4,982	486	5,468
February	23	215	4,750	202			4,952	112	5,064
March	26	139	3,606				3,606	470	4,076
April	24	81	1,806	143			1,949	360	2,309
May	25	105	1,777	840			2,617	894	3,511
June	24	134	1,567	485	1,166		3,218	868	4,086
July	24	150	2,826	260	508		3,594	1,076	4,670
August	26	147	3,022	810			3,832	708	4,540
September	25	142	1,237	2,303			3,540	376	3,916
October	27	140	1,386	2,272	120		3,778	470	4,248
November	24	153	861	1,733	235		2,829	294	3,123
December	24	138	1,157	1,817	306	27	3,307	370	3,677
Year	298	143	28,957	10,885	2,335	27	42,204	6,484	48,688
Transfers			-359	-903	-544				
Total			29,316	9,982	2,879	27	42,204	6,484	48,688
Stock-pile over and underrun		-2	-443		+319		-124		-124
Net Total	298	141	28,873	9,982	3,198	27	42,080	6,484	48,564

Table IV.

Shipments.

Grade	East End Tons	Happy Hollow Tons	"D" Shaft Tons	Total Tons
East End Bessemer	18,331			18,331
Angeline Bessemer		2,078	11,918	13,996
Angeline		211	1,398	1,609
Angeline Silica			2,537	2,537
Total	18,331	2,289	15,853	36,473

Table V.

Stock-Pile Balances - Dec. 31st, 1919.

Angeline Bessemer	3,038 Tons
Angeline	8,373 "
Angeline Silica	661 "
Hard Ore Bessemer	27 "
Total	12,099 "

Table VI.

Delays.

Date	Hours	Tons Lost	Cause	Repair Cost
Nov. 18	1½	30	No electric current.	

Table VII.

Delays Caused by Lack of Current.

Date	Hours	Tons Lost	Cause
Nov. 18	1½	30	Main line trouble.

Table VIII.

Estimate of Ore Reserves.

No. 56 Pillar. "D" Shaft.

Sub-Level	Developed Ore			Probable Ore			Total Ore		
	Bessemer Tons	Angeline Tons	Total Tons	Bessemer Tons	Angeline Tons	Total Tons	Bessemer Tons	Angeline Tons	Total Tons
1375		2,000	2,000					2,000	2,000
1350	4,000	15,000	19,000				4,000	15,000	19,000
1318	30,000	15,000	45,000				30,000	15,000	45,000
1290	12,000		12,000	13,000	5,000	18,000	25,000	5,000	30,000
Total	46,000	32,000	78,000	13,000	5,000	18,000	59,000	37,000	96,000
Less 10% Rock & 10% Loss	9,000	6,000	15,000	3,000	1,000	4,000	12,000	7,000	19,000
Net Total	37,000	26,000	63,000	10,000	4,000	14,000	47,000	30,000	77,000

Factor used:- 10 cu. ft. per ton.

GENERAL.

Labor.

There was no change in the wage-scale during the year, the scale in effect Oct. 1st, 1918 being maintained.

There was no shortage of labor during the year. All men returning from the Army and Navy were given their old jobs upon application.

New Construction.

E and A. 361. Reopening the Mine.

The seventh level was reopened from "D" Shaft west to the boundary. 500 feet west of the shaft the ground was so loose that a new drift through the rock had to be driven. No ore has been found in this part of the mine.

Exploration.

Underground Diamond Drilling.

In November a hole was started south-east from the drift east of No. 56 timber-raise, and was driven 59 feet, but the ground caved so badly that the hole was abandoned.

Surface.

The houses on Angeline Street east of No. 56 timber-raise have been sold and moved away. The old dry was also torn down, and most of the material derived from it was sold to the Cliffs Shaft Mine.

The buildings at the East End and at Happy Hollow have all been removed, and the railroad track east of No. 56 raise has been taken up. The electric hoist that was at Happy Hollow has been erected at the shaft of No. 3 Mine behind the Hard Ore barn. The hoist that was at the East End has been sent to the Republic Mine.

East End Pit.

The East End Pit was operated continuously until August, the ore mined in the winter being dumped on the stock-pile. The last ore was cleaned up on August 23d, and all supplies and equipment were removed.

A pipe-line has been laid from the pit to the end of the 30 inch wood-stave pipe that carries the water from the Lake Angeline basin, and a pump will be installed during the winter to throw from the East End Pit to the big pipe. All the water draining from the east end of the mine will be diverted to the East End Pit, which will serve as a sump.

Happy Hollow Pit.

Ore was mined in the bottom of the Happy Hollow Pit from the beginning of the year until the workings were filled with quicksand in April. This ore was stocked in ore-cars.

In October work was resumed under contract, and 1,812 tons of ore were scrammed out and hauled to the stocking grounds at "D" Shaft.

UNDERGROUND.

No. 56 Pillar.

1,000 feet east of "D" Shaft is an old timber-raise called No. 56. Adjacent to this raise and west of it the P. & L. A. I. Co. left a pillar 120 feet wide north and south to support the track and road. Four sub-levels have been opened in this pillar and the outline of the ore has been determined on all sides but the south-west.

The lowest sub-level, at 1290 feet above sea-level is small, being only 100 feet long and 30 feet wide, but there is a strong probability that ore will be found to the south-west. This sub-level was opened from Raise 4A, which was put up in 1918 from the fourth level to the 1318 foot sub-level.

The 1318 foot sub-level shows the largest area of ore, and one contract is still developing new ore to the south-west. The ore-body has a maximum width north and south of 120 feet and a maximum length of 240 feet. The outline is irregular. Three raises, 2A, 2B and 2C, were put up from this sub-level to the 1350 foot sub-level, and Raises 2A and 2C have been continued to the 1375 foot sub-level. The ore on the 1350 foot sub-level has a maximum dimension north and south of 120 feet and east and west 240 feet. One contract is stoping at the south-west corner and two are drifting along the north side.

The 1375 foot sub-level shows a smaller area, the dimension north and south being 120 feet and the average east and west being about 70 feet. The upper limit of the ore is also irregular. There are four gangs working on this sub-level mining the ore up to the capping. The maximum height above the level thus far has been about 30 feet.

"D" Shaft.

The main drift west of "D" Shaft has been reopened, except at a point 500 feet west of the shaft, where it was necessary to drift around the caved ground. The cross-cut south to the old sub-shaft, 600 feet west of "D" Shaft, has been partly reopened, and an effort is being made to reopen the sub-level 50 feet above the seventh level close to the west boundary. Only two gangs are working on this level.

ANGELINE MINE.

COMPARISON OF COST SHEETS FOR 1918 AND 1919.

The Angeline Mine worked in "D" shaft on double shift during all of 1919. In the first half of the year the East End Pit was operated, and in the early spring and in the fall a small product was obtained from the Happy Hollow Pit. In 1918 most of the ore came from the East End with a small tonnage from Happy Hollow. "D" shaft produced only 1,888 tons.

Wages were unchanged in 1919, but in 1918 there were successive 10% increases on April 16th, August 1st, and October 1st, making the average wages in 1919 18.4% higher than in 1918. This factor, as well as the reduction in tonnage produced from open pits and the increase in ore from underground, contributed largely to the increase in cost per ton in 1919.

Production.

	Total Tons	Per Day Tons
Year 1918	57,439	357
Year 1919	42,080	141
Decrease	15,359	218

Labor.

	1918	1919
Average number of men	40	66
Average rate per day	$ 4.80	$ 5.23

Tons per Man per Day.

	1918	1919
Surface	10.78	6.43
Underground	13.10	3.91
Total	5.91	2.35

Cost of Production.

	1918	1919
Labor	$ .789	$ 2.194
Supplies	.743	.837
Total	$ 1.532	$ 3.031

GENERAL EXPENSE.

No. 26 - Insurance.

1918	$ 357.07	$ .006
1919	359.20	.009
Increase	$ 2.13	$ .003

No. 27 - Engineering.

1918	$ 21.89	$ .000
1919	302.09	.007
Increase	$ 280.20	$ .007

In 1918 practically all engineering charges were absorbed by E and A. No. 361.

No. 28 - Analysis.

1918	$ 516.61	$ .009
1919	2219.48	.053
Increase	$ 1702.87	$ .044

The increase is partly due to higher average wages, but mostly to the operation of "D" shaft, requiring stope-samples and production-samples from several grades daily.

No. 30 - Personal Injury Expense.

1918	$ 451.19	$ .008
1919	1224.37	.029
Increase	$ 773.18	$ .021

This is a Central Office charge. The principal items were as follows:-

	1918	1919
Medical & Hospital Exp.	$ 234.14	$ 347.00
Compensation Charges	72.47	99.00
Hospital Deficit	144.58	811.37
Total	$ 451.19	$ 1257.37

No. 30a - Mine Office.

1918	$ 1825.25	$ .032
1919	4263.18	.101
Increase	$ 2437.93	$ .069

A mine office was not operated until April 1918, and thereafter in that year a large proportion of the cost for this account was absorbed by E and A. No. 361.

MAINTENANCE.

No. 125 - Tracks and Yards.

1918	$ 1710.50	$ .030
1919	1718.87	.041
Increase	$ 8.37	$ .011

No. 126 - Docks, Trestles and Pockets.

1918	$ 99.86	$ .002
1919	242.15	.006
Increase	$ 142.29	$ .004

In 1919 the principal charges are for preparing stocking-floors.

MAINTENANCE. (Continued)

No. 127 - Buildings.

1918	$ 131.39	$ .002
1919	493.32	.012
Increase	$ 361.93	$ .010

In 1918 nearly all maintenance charges were taken up in construction charges. In 1919 the principal charges were for painting and for changing the piping in the dry, lockers for the carpenter shop, screen-doors and electric lights in the office, and moving surface dry from the East End to No. 56.

No. 128 - Shop Machinery.

1918	$ 172.67	$ .003
1919	94.57	.002
Decrease	$ 78.10	$ .001

1918 charges covered the installation of a hammer and drill-sharpener in the blacksmith shop.

No. 129 - Boiler Plant.

1918	$ 1.46	$ .000
1919	39.47	.001
Increase	$ 38.01	$ .001

No. 130 - Hoisting Machinery.

1918	$ 874.13	$ .015
1919	623.22	.015
Decrease	$ 250.91	$ .000

In 1918 the principal charges were for repairs to Happy Hollow and East End hoists and for 1950 feet of hoisting-rope. In 1919 there were minor repairs to "D" shaft hoist, and the cost of dismantling the East End and Happy Hollow hoists was charged to this account.

No. 131 - Compressors and Power Drills.

1918	$ 48.03	$ .001
1919	403.64	.009
Increase	$ 355.61	$ .008

In 1919 one drill was charged out. The balance is for labor repairing and thawing out the air-line from the Lake Mine.

No. 132 - Pumping Machinery.

1918	$ 446.72	$ .008
1919	1054.70	.025
Increase	$ 607.98	$ .017

In 1919 the principal items were the cost of repairing and removing the pumps from the East End Pit, and for disconnecting and repairing the Cameron pump at "D" shaft and laying siphon pipes.

No. 133 - Top Tram Engines and Cars.

1918	$ 446.72	$ .008
1919	1054.70	.025
Increase	$ 607.98	$ .017

1919 charges were higher principally on account of repairing side-dump cars at the East End and taking up rail and moving sheaves at the East End and Happy Hollow Pits.

No. 134 - Skips and Skip-Roads.

1918	$ 857.73	$ .015
1919	1144.23	.027
Increase	$ 286.50	$ .012

In 1919 a new skip was built and the old one repaired, and some new runners were put in the shaft. There were charges both years for cutting ice.

No. 135 - Underground Tracks and Cars.

1918	$ 422.38	$ .007
1919	1347.03	.032
Increase	$ 924.65	$ .025

In 1918 most of these charges were absorbed by construction accounts. In 1919 operations underground were more than doubled, and new cars were built and much track laid.

MAINTENANCE. (Continued)

No. 137 - Telephones and Safety Devices.

1918	$ 149.90	$ .003
1919	385.48	.009
Increase	$ 135.58	$ .006

The increase in 1919 is in underground safety precautions and guards, and for outfit for the first-aid room.

MINING EXPENSE.

No. 150 - Air-Pipes.

1918	$ 618.61	$ .011
1919	1205.42	.029
Increase	$ 586.81	$ .018

The increase is due to the extended operations underground in "D" shaft.

No. 151 - Compressors.

1918	$	$
1919	2145.00	.051
Increase	$ 2145.00	$ .051

The Angeline Mine buys its air from the Lake Mine. In 1918 this charge was split up and charged to the various accounts for which the air was used, mostly "breaking ore."

No. 152 - Hoisting.

1918	$ 1551.86	$ .027
1919	4331.80	.103
Increase	$ 2779.94	$ .076

In 1918 hoisting was started at both Happy Hollow and "D" shaft. "D" shaft started late in the year, on one shift only. Hoisting was done on 2 shifts during most of 1919.

No. 153 - Pumping.

1918	$ 1135.85	$ .020
1919	5589.96	.133
Increase	$ 4454.11	$ .113

Pumping was not started at "D" shaft until late in 1918.

No. 154 - Sinking and Shaft Repairs.

1918	$	$
1919	40.68	.001
Increase	$ 40.68	$ .001

1918 charges were taken up on E and A. No. 361.

No. 155 - Rock Drifting.

1918	$ 4176.82	$ .073
1919	1474.47	.035
Decrease	$ 2702.35	$ .038

In 1918 an expensive raise was charged to this account. In 1919 much of the seventh level drifting was charged to E and A. 361.

No. 156 - Breaking Ore.

1918	$ 34585.03	$ .602
1919	52771.19	1.254
Increase	$ 18186.16	$ .652

In 1918 most of the ore was mined by steam-shovel, but in 1919 most of it came from drifts and raises underground.

No. 157 - Tramming.

1918	$ 5321.06	$ .093
1919	13345.31	.317
Increase	$ 8024.25	$ .224

In 1918 the bulk of the ore was mined by steam-shovel. In 1919 most of it came from underground. On account of water in the raises, it was necessary to tram on two shifts in 1919.

MINING EXPENSE. (Continued)

No. 159 - Timbering.

1918	$ 1308.33	$ .023
1919	9577.34	.227
Increase	$ 8269.01	$ .204

The increase is due to the increased production from underground in 1919.

No. 160 - Captain and Bosses.

1918	$ 2120.96	$ .035
1919	6253.33	.149
Increase	$ 4132.37	$ .114

Captain Marks started work here on April 15th, 1918. One shift-boss was put on later. In 1919 there were two bosses most of the year.

No. 161 - Dry-House.

1918	$ 373.86	$ .007
1919	2193.02	.052
Increase	$ 1819.16	$ .045

The dry at "D" shaft was in use only a small part of 1918.

No. 162 - Top Landing and Tramming.

1918	$ 1508.12	$ .026
1919	5486.96	.130
Increase	$ 3978.84	$ .104

Hoisting on one shift started late in 1918. In 1919 hoisting was done on two shifts most of the year.

No. 163 - Stocking Ore.

1918	$ 873.40	$ .015
1919	1829.39	.043
Increase	$ 955.99	$ .028

The increase is due to tearing down and erecting stocking trestles in 1919, which was necessary twice during the season.

No. 165 - Stripping.

1918	$ 25938.72	$ .451
1919	4786.44	.114
Decrease	$ 21152.28	$ .337

There was a relatively small amount of stripping done in 1919.

No. 166 - Cave-In.

1918	$	$
1919	3.40	.000
Increase	$ 3.40	$ .000

No. 171 - Ventilation.

1918	$ 371.49	$ .006
1919		
Decrease	$ 371.49	$ .006

A fan was employed on the seventh level for a short time in 1918.