The mine was expected to start Operating October 1917, later it was deferred to March 1918, on account of extra sinking. The stime started operating January 1st, 1919.

Overrun includes $21,600 Administration, and $16,437 Central Office on which there were no estimates. Taxes overrun $22,038 and Personal Injury $4,341. The latter due to compensation law going in effect after estimate was made. This includes payment for one fatal accident. During the last three years there have been large increases in labor charges.

ACCOUNT NO. 2. MAINTENANCE.

Estimate	$ 8,499.00
Expended	17,435.57 to Dec. 31, 1918.
	$ 8,936.57 overrun

This over expenditure includes $4,675.18 in surface improvement on which there was no estimate. The other large charges to this account are Hoisting Machinery #2E $4,146.31 and Pumps #2G of $6,243.18. These two items alone, amount to $1,890.00, more than the whole estimate. The overrun in hoisting machinery and pumps was due to regular charges over which we had no control.

ACCOUNT NO. 3 SINKING IN SAND.

Estimate	$ 6,185.00
Expended	4,291.48
Balance	$ 1,893.52

The sinking in sand was less expensive than estimated.

ACCOUNT NO. 4 - SINKING IN ROCK.

Estimate - Opening Statement	$216,017.00
To which should be added supplementary Estimate of sinking 430 feet to 2490 ft.	46,870.00
Total Estimate	$262,887.00
Amount expended	251,376.79
Unexpended Balance	$ 11,510.21

Distance sunk in rock 2436.5 feet. Cost per foot $103.17

Estimated cost per foot:-

1033.5	Circular shaft	$109.00 per ft.
976.0	Rectangular	105.00 "
430.0	"	109.00 "
2439.5	feet	$107.76 per ft.

This shows the shaft was sunk for $4.23 per foot less than the estimated price.

The annual report for 1917 went into all the details of shaft sinking including concreting.

ITEM NO. 5. - DRIFTING.

The estimate for Drifting amounts to $99,900, covering 8,410 feet made up as follows:-

Original Estimate	5,500 ft.	@ $12.00	$66,000.00
Negaunee-Athens Drift	1,020	11.00	11,220.00 —
Extra drifting on account of sinking to 2490 feet	710	12.00	8,520.00
4th level	1,180	12.00	14,160.00
TOTAL -	8,410	$11.76	$99,900.00

This item #5 on December 31st shows $244,774 or an over expenditure of $144,874. The total feet drifted was 10,857 which cost $22.55 per foot or an increased cost per foot of 92% over the estimated cost of $11.76. The drifting was all done in the last 16 months at a time when both labor and supplies were practically 100% higher than when estimate was made in 1912.

The drifting covers not only the cross cuts to the ore body and foot wall drifts, but also cross cuts in ore; the latter in most cases, being more expensive than the rock drifts.

ITEM NO. 6 - PLATES AND POCKETS.

Estimate Opening Statement - 3 Plates & Pocket	$21,000.00
4th Level Plat & Pocket Authorized	7,000.00
Total Estimate	$28,000.00
Total expenditure	62,260.46
Over expenditure	$34,260.46

The estimate contemplated 4 plats and pockets at a cost of $7,000 each. In addition there was charged to this account the plat at the bottom of the shaft to clean the skip pit.

When the estimate was made it was thought that the plats could be cut when the sinking was in progress, so that the overhead costs would be distributed between the two accounts. It was decided that if the sinking were interrupted it might hurt the organization and result in less speed. This change added extra expense on both items 4 and 5. The principal cause of the over expenditure, however, was the skip pit plat and the increase in both labor and supplies.

ITEM NO. 8. - PREPARING SITE.

Estimate	$10,000.00
Expended	11,773.37
Over expenditure	$ 1,773.37

Due to increase in labor.

ITEM NO. 9 - TEMPORARY EQUIPMENT.

Estimate	$ 6,500.00
Expended	23,029.73
Over expenditure	$16,529.73

The estimate was made up as follows:-

9c	Derricks & Buckets	$ 500.00
9d	Miscellaneous Buildings	1,000.00
9e	Concrete Equipment	5,000.00

There was expended:-

9a	Surface tracks and cars	$4,638.08)	
9b	Underground " " "	2,264.61)	
9f	Tools in General use	250.52)	on which there was no estimate.
9h	Compressors & Air pipes	579.00)	
9i	Ventilating System	4,102.54)	
	TOTAL -	$11,834.75)	

The concrete equipment costs were $8,737.85 or $3,737.85 more than estimates. These items make up most of the deficit.

ITEM NO. 10 - PERMANENT EQUIPMENT.

Estimate	$27,320.00
Expended	64,143.96
Over expenditure	$36,823.96

The principal items of over expenditure are as follows:-

10a Timber tracks and cars.

Estimate	$ 770.00
Expended	2,739.54
Over expenditure	$1,969.54

Due to more track laid than estimated. More cars built and increase in cost of rail and other material, also labor.

10c Electric Haulage tracks.

Estimate	$4,675.00
Expended	20,622.87
Over expenditure	$15,947.87

The estimate was for 5,500 feet of drifting, while actually this covered about 10,000 feet at greatly increased cost for labor and supplies.

10d Power Drills.

Estimate	$ 1,575.00
Expended	10,623.39
Over expenditure	9,048.39

This covers the expenditure for all drills bought to Dec. 31, 1918, while there could only have been included the original equipment for sinking.

10e Timber Tunnel.

Estimate	$ 5,000.00
Expended	8,031.13
Over expenditures	$ 3,031.13

Due to increase in costs for labor and material.

10g Road tunnel under railroad tracks.

No Estimate Cost $ 1,155.31

10h Permanent Air Lines.

No estimate Cost $6,442.30

This covers 4" and 6" air lines in main drifts.

ITEM NO. 12 & 13. - OFFICE AND LABORATORY EQUIPMENT.

Estimate	$1,900.00
Expended	2,450.01
Over expenditure	$ 550.01

This is due to high cost of equipment. This item will show a greater over expenditure as all of the laboratory equipment has not been purchased.

ITEM NO. 14. - EXPLORATORY.

Estimate	$97,759.67
Expended	103,798.34
Over expenditure	$ 6,038.67

This amount expended in 1918. Drilling in mine and concreting surface holes at ledge.

14a Testing drill hole.

No estimate Cost $ 8,870.65

14b Taxes 1912

No estimate Cost $ 7,703.91

ESTIMATE OF PROBABLE ORE IN ATHENS MINE DECEMBER 31, 1918.

Ore above 4th level	274,500 tons,
" between 4th and 8th levels	2,471,600 "
" " 8th and 9th levels	559,000 "
" " 9th and 10th levels	320,750 "
Total ore in sight	3,625,850 tons.
Total ore mined to December 31, 1918	35,111 tons.
Balance left in mine December 31, 1918	3,590,739 tons.

GRADED AS FOLLOWS:-

Non-Bessemer Ore

Developed	3,590,739 tons.

Assumption: 12 cu. ft. equals one ton; 10% deduction for rock. 10% duduction for loss in mining.

Percentage of Bessemer 0.

ESTIMATED ANALYSES.

	IRON	PHOS.	SILICA	MANG.	ALUM	CA.O.	MAG.	SUL.	LOSS BY IGNITION	MOIST.
Natural	48.77	.092	8.70	0.50	3.44	0.45	1.40	.017	2.60	16.00

ATHENS MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR - 1918.

GRADE	IRON	PHOS.	SILICA	IRON NATL MARKET PRICE
Athens,	59.48	.118	5.81	
Bunker Hill,	60.84	.126	4.90	
Mitchell Lease,	60.26	.124	5.21	
Corbett Lease,	60.39	.127	5.03	

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR - 1918.

Athens, (
Bunker Hill,) All Mixed
Mitchell Lease, (
Corbett Lease,)

ORE STATEMENT AND SHIPMENTS FOR YEAR 1918.

	ATHENS	MITCHELL LEASE	CORBETT LEASE	BUNKER HILL	TOTAL
On hand Jan. 1st, 1918,	530				530
Output for Year,	28,235	5,507	1,899	2,457	37,568
Total,	28,765	5,507	1,899	2,457	38,098
Shipments,	15,013	5,507	403	2,173	23,096
Balance on Hand,	13,752	0	1,496	284	15,002

1918 - 2-8 Hour Shifts for year.

ATHENS MINE.

SOUTH JACKSON AND CRUSHER - 1918.

Work started in the Pit May 23rd when a small crew was employed in cleaning up the steam shovel cut which had been made during the winter. There was little mining done during the season, 15,879 tons being the quantity shipped. It was expected that the product would be considerably larger and the Pit was in shape to handle at least 5,000 tons per month. Mining started June 1st and continued until early in August, 10,000 tons being mined, when orders to shut down were received. Later another cargo was sold and mining was resumed on October 9th and continued until November 12th. The ore mined during the season came principally from the Southeast end of the pit alongside of the steam shovel cut started a year ago, and along the South verticle wall. The product ran slightly above the guarantee.

Throughout the year we had no trouble on account of the scarcity of labor such as it was. It was made up principally of boys just above the age limit where they would be permitted to work, and old men.

During the interval when no mining was being done, a crew was employed in stripping. Here on the Southwest end near the section corner $\frac{1}{12} \mid \frac{6}{7}$ a great deal of over-burden had been dumped from previous stripping. This had to be removed before further mining could be done in this territory. This material was trammed by car to a dump pit North of the Lucy shaft. The work during the Summer has left this area available for mining during the coming year.

The costs for mining were much above the average this year as wages were high and supplies were extremely expensive. In addition to this, stripping for future work, done during the year, was charged against the yearly product. Track maintanence by the railroad Company which has never before been charged against the mine was also a considerable item of expense.

EXPLORATIONS.

Explorations were conducted by churn and diamond drills throughout the most of the season. This was carrying on the work started a year ago. The churn

drill holes were all located to the West and Southwest of the Crusher following up the lead of merchantable ore of Jackson grade found near what was formerly known as the old Manganese Pit which was located about 200 feet West of the Southwest corner of the Crusher. The explorations last year had extended to a point about 600 feet West of the Crusher building and during the present season were extended to a point about one-half mile West and to the Southwest along the North edge of the Diorite Hill. Here the old Jackson Company mined in a line of open pits years ago. Churn drill holes to the North and South sides of these pits failed to disclose ore except as the old Manganese Pit was approached. Several diamond drill holes were put down West of the South Jackson and just to the Northeast of Cornishtown. At one of these, viz. #107, a short run of merchantable ore was found at 1645 feet.

The detail of the years' drilling follows at the end of the report.

ESTIMATE OF TONNAGE.

In preparing these figures, they have been divided into ores which can be mined by the present system, that is, open pit method which has been employed at the Jackson Mine for a number of years and by the milling system which is the method I would recommend when no ore remains above the present Railroad level.

The tonnage has been estimated for the Jackson guarantee of 39.60% combined iron and manganese, and also if this were changed to 38.60% and 37.60%, respectively.

Total tons available by making 39.60% grade.

Above present pit available by present system of mining:

On Southwest side - - - - - - - - - - -	-35,000	
North of Lucy Pit - - - - - - - - - - -	25,000	
South and Southwest of Lucy Pit - - -	25,000	
TOTAL -		85,000

Below present pit, and above drainage tunnel available by milling:

West of crusher - - - - - - - - - - - -	186,967	
Area A below bottom present pit by churn drill drilling - - - - - - - - -	110,000	
Probable extension of Area A East onto Lucy Pit - - - - - - - - - - - -	90,000	
TOTAL -		386,967
GRAND TOTAL -		471,967

Total tons available by making 38.60% grade.

Above present pit available by present system of mining:

On Southwest side - - - - - - - - - - -	35,000	
North of Lucy Pit - - - - - - - - - - -	25,000	
South and Southwest of Lucy Pit - - -	25,000	
TOTAL -		85,000

Below present pit and above drainage tunnel available by milling:

West of Crusher - - - - - - - - - - - -	257,572	
Area A and extension below bottom present pit by churn drilling - - -	138,437	
Probable extension of Area A into Lucy Pit - - - - - - - - - - - - - - -	90,000	
TOTAL -		486,009
GRAND TOTAL -		571,009

Additional tonnage secured by making a grade of 38.60% - 99,042 tons.

Total tons available by making 37.60% grade.

Above present pit available by present system of mining:

On Southwest side - - - - - - - - - - -	35,000	
North of Lucy Pit - - - - - - - - - - -	25,000	
South and Southwest of Lucy Pit - - -	25,000	
TOTAL -		85,000

Below present pit and above drainage tunnel available by milling:

West of Crusher - - - - - - - - - - - -	257,572	
Area A and extension below bottom present pit by chur drilling - - - -	169,687	
Probable extension of Area A East into Lucy Pit - - - - - - - - - - - -	90,000	
TOTAL -		517,259
GRAND TOTAL -		602,259

Additional tonnage secured by making a grade of 37.60% instead of 38.60% - 31,250 tons.

Additional tonnage secured by making a grade of 37.60% instead of 39.60% - 130,292 tons.

METHOD OF MINING.

Mining was by the regular method which has been employed in this pit for years. The ore being broken down in the breast stopes, and trammed to rail-

road cars located in a cut through the center of the Pit. The ore excavated last winter for the new track to the Lucy Pit was of merchantable grade. This was shipped during the season. A small quantity of ore this year came from the drainage tunnel which is located about 60 feet below the collar of the shaft in front of the Crusher. A drift was extended Westerly 265 feet towards the Manganese Pit area. About 90 feet of dike was cut, but when the drifting was stopped in August, the material was of the ore formation. During the coming season, I would advise extending this drift West into the area developed by the churn drill in this direction. I would also extend a drift to the Southeast under the present open pit towards the Lucy Mine, this to be used as a main haulage way if milling is resorted to at some future time. If these drifts are driven during the time the Pit is operating the material can be loaded in cars and shipped with the regular product. If work is done at any other time, it would have to be stocked which would add considerably to the expense.

About the middle of November, the steam shovel was moved to the Pit and the cut started a year ago was extended into the Lucy Pit. Here on the left is a bank of ore about 30 feet high. I would recommend that during the coming season that an experiment be made to mine some of this bench by means of the steam shovel. I believe it can be done very cheaply. The only difficulty might be in holding up the guarantee, but it would be well worth experimenting a little to see if it would not give satisfactory results. It might be possible to sweeten the product somewhat by mining in a few breasts on the South side of the Pit where the ore averages of higher grade than on the West side.

STRIPPING.

Stripping was conducted throughout the Summer near the section corner $\frac{1}{12}\left|\frac{6}{7}\right.$. Here the waste which had been scrapped back from the former stripping so that in some places it was 15 feet in thickness, however, the grade of ore in this particular locality was the best in the Pit, and it was necessary to strip the over-burden in order to keep our product clean. This had to be shoveled by hand into small tram cars and trammed a distance of several hundred feet. The cost per ton is as much as handling a ton of ore.

On the North side of the Lucy Pit an area was also cleaned where stripping was started a year ago. It is at this point where I suggest trying the steam shovel. To the Southwest of the Crusher a small amount of stripping was done during November before the cold weather set in. Here the work should be continued during the coming season.

CRUSHER.

The Jackson Crusher was used only a short time during the past season. The District Crusher crew from the Maas was at the Jackson from May 9th until the end of the month crushing a cargo of Scotch ore. This grade gives this plant continual trouble as it jams in the unloading pocket, making it extremely difficult to load into the skips. This year it was particularly bad as the chunks seemed larger than usual. During the summer baffles were placed over the grizzly at the Maas Crusher to prevent the large chunks from smashing down into the spider at the top of the crusher opening. This made it possible to handle the Scotch ore there without further difficulty.

GENERAL SURFACE.

A quantity of scrape iron scattered about the surface was collected in May and shipped during the month of June. In February the boiler plant just North of the Crusher was dismantled and the boilers sent to the Helmer Mine at Kinney, Minnesota.

In June the Railroad Company placed new ties under some of the tracks leading to the Crusher building and by a ruling of the Railroad Administration this work was charged directly to the Mine. This made an unusual maintanence expense for tracks, which never before has been borne by the Mining Department.

EXPLORATIONS.

A detail of the explorations follows below. The locations of these drills are all given in the Negaunee District co-ordinance. These holes can be readily located on the grounds by referring them to the Southwest corner of the shaft in front of the Crusher. The co-ordinates of which are S4450 W5580

SOUTH JACKSON ESTIMATE DECEMBER 31ST., 1918

Above present pit available by present system of mining:

On Southwest side - - - - - - - - - - - -	35,000	
North of Lucy Pit - - - - - - - - - - - -	25,000	
South and Southwest of Lucy Pit - - - - - - -	25,000	
TOTAL -		85,000

Below present pit and above drainage tunnel available by milling:

West of Crusher - - - - - - - - - - - -	186,967	
Area A below bottom present pit by churn drilling - - - - - -	110,000	
Probable extension of Area A East onto Lucy Pit - - - - - - -	90,000	
TOTAL -		386,967
GRAND TOTAL -		471,967

ANALYSES.

	IRON	PHOS.	SUL.	MANG.	MOIST.	SIL.
Natural	36.83	.066	.010	2.00	7.00	31.56

CHURN DRILL HOLES.

Hole #105. Location Negaunee coordinates, S4543 W6063, elevation 1467, depth of hole 80 feet.

FROM	TO	MATERIAL	COMBINED IRON AND MANGANESE
0	8	surface	
8	60		43.20%
60	80		35.50%

Hole #106. Location Negaunee coordinates, S 4425 W6230, elevation 1464, depth of hole 339 feet. Drilled to 339 feet by churn drill and finished by diamond drill - See D.D. Hole #106.

0	15	Surface	
15	25		36.00%
25	130		39.60% plus

Hole #109. Location Negaunee Coordinates, S4425 W6435, elevation 1461, depth of hole 105 feet.

0	7	Loose rock.	
7	85	Lean ore	38.84%
85	105	Lean ore	34.75%

Hole #110. Location Negaunee coordinates, S4425 W6632, elevation 1460.8, depth 100 feet.

0	9	Broken ledge	
9	100	Lean ore	32.25%

Hole #111. Location Negaunee coordinates, S4425 W6832, elevation 1465.1, depth 100 feet.

0	8	Surface and loose rock	
8	100	Lean ore	34.18%

Hole #112, Location Negaunee coordinates, S4425 W7035, elevation 1469.8, depth 90 feet.

0	10	Surface	
10	40		41.33%
40	90		32.00%

Hole #113. Location Negaunee coordinates, S4625 W7035, elevation 1474.9, depth 41 feet.

9	15	Surface
15	41	Diorite

Hole #114. Location Negaunee coordinates, S4635 W6820, elevation 1473.4, depth 34 feet.

FROM	TO	MATERIAL	COMBINED IRON AND MANGANESE
0	13	Surface	
13	34	Diorite	

Hole #115. Location Negaunee coordinates, S4565 W6575, elevation 1468.5, depth 100 feet.

			IRON	MANGANESE	COMBINED
0	10	Surface			
10	30				33.00%
30	45				42.00%
45	70		51.78%	7.20%	56.98%
70	75		42.00%	4.52%	46.52%
75	90		44.47%	12.89%	57.36%
90	100		27.05%	2.79%	29.84%

Hole #116. Location Negaunee coordinates, S4525 W6330, elevation 1467, depth 100 feet.

			COMBINED IRON AND MANGANESE
0	8	Surface	
8	25	Lean ore	
25	100		38.10 to 50.40%

Hole #117. Location Negaunee coordinates, S4510 W6448, elevation 1464.6, depth 100 feet.

0	15	Surface	
15	100		40.00 to 50.00%

Hole #118. Location Negaunee coordinates, S4425 W6330, elevation 1465.5, depth 100 feet.

0	15	Surface	
15	100	Lean ore	32.25 to 36.30%

Hole #120. Location Negaunee coordinates, S4365 W6105, elevation 1449, depth 75 feet.

0	5	Surface	
5	75	Lean ore	35.65 to 37.00%

Hole #121. Location Negaunee coordinates, S4560 W6744, elevation 1471 depth 90 feet.

0	8	Surface	
8	90	Lean ore	31.50 to 34.00%

Hole #122. Location Negaunee coordinates, S4537 W6666, elevation 1464, depth 90 feet.

FROM	TO	MATERIAL	COMBINED IRON AND MANGANESE
0	90	Lean ore	30.00 to 35.00%

Hole #123. Location Negaunee coordinates, S4496 W6553, elevation 1465.3, depth 100 feet.

0	100	Lean ore	34.50 to 38.50%

Hole #124. Location Negaunee coordinates, S4426 W7235, elevation 1465.7, depth 100 feet.

0	3	Sand	
3	100	Lean ore	36.86%

Hole #125. Location Negaunee coordinates, S4426 W7431, elevation 1466.1, depth 100 feet.

0	2	Sand	
2	5		33.84%
5	100		39.90%

Hole #126. Location Negaunee coordinates, S4410 W7624, elevation 1478.3, depth 100 feet.

0	95		30.00 to 35.00%
95	100		40.64%

Hole #127. Location Negaunee coordinates, S4890 W6815, elevation 1522, depth 34 feet.

0	34	Sand and dike.

Hole #128. Location Negaunee coordinates, S4830 W6625, elevation 1515.8, depth 119 feet.

0	25		32.00% except 10 feet from
25	35		38.64%

Hole #129. Location Negaunee coordinates, S4778 W6404, elevation 1508.6, depth 210 feet.

0	4	Sand	
4	20		40.09%
20	100	Lean ore	

Hole #130. Location Negaunee coordinates, S4816 W6126, elevation of collar 1533, depth 135 feet.

FROM	TO	MATERIAL	COMBINED IRON AND MANGANESE
0	90		30.00 to 35.00% except from
90	95		39.64%

DIAMOND DRILLS.

Hole #106. Location Negaunee coordinates, S4426 W6230, elevation 1467, depth 1213 feet.

0	15	Surface	
15	130		39.60%
130	1176	Soft ore jasper and occasional run of Jackson grade ore.	
1176	1196	Dike	
1196	1213	Diorite - bottom.	

Hole #107. Location Negaunee coordinates, S3810 W7406, elevation 1486.7, depth 1800 feet.

0	20	Surface	
20	140	Soft ore jasper, no analyses.	
140	255	Lean ore	40 to 50%
255	1645	Lean ore, soft ore jasper and dike.	
1645	1670	Ore	58.64%
1670	1690	Soft ore jasper and lean ore.	
1690	1704	Ore	58.67%
1705	1715	Soft ore japper and dike.	
1715	1720	Ore	57.70
1720	1776	Dike	
1776	1800	Greenstone	

Hole #108. Location Negaunee coordinates, S4150 W7434, elevation 1452, depth 1874 feet.

0	9	Surface	
9	1866	With a run of 49.75% ore from 105 to 115 and 10 feet 1795 to 1805.	54.40%
1866	1874	Dike.	

Hole #119. Location Negaunee coordinates, S4055 W7700, elevation 1453, depth 1245 feet.

0	14	Surface	
14	64	Soft ore jasper - no analyses.	
64	90		49.22%
90	710	Runs of soft ore jasper and lean ore; the ore analysis slightly under 50%.	
710	832	Dike	
832	1085	Soft ore jasper.	
1085	1130	Dike	
1130	1245	Soft ore jasper - depth Dec. 31st.	

SOUTH JACKSON MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR 1918.

GRADE	IRON	PHOS.	SILICA	MANG.
South Jackson,	39.19	.076	33.94	2.33

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR 1918.

	Mine				Lake Erie		
GRADE	IRON	PHOS.	SIL.	MANG.	IRON	MOIST.	MANG.
South Jackson,	39.24	.076	33.87	2.33	40.08	7.27	2.70

ORE STATEMENT AND SHIPMENTS FOR 1918.

	YEAR	LAST YEAR
Output for Year,	15,879	47,836
Shipments,	15,879	47,836
Balance on Hand,	0	0

1918 - Mine operated 1-10 Hr. Shift - May 28th to November 13th

1917 - Mine operated 1-10 Hr. Shift - April 27th to November 10th.

SOUTH JACKSON MINE.

COMPARATIVE MINING COST FOR YEAR.

	1 9 1 8.	1 9 1 7.	INCREASE.	DECREASE.
PRODUCT	15,879	47,836		31,957
General Expense	.073	.027	.046	
Maintenance	.282	0	.282	
Mining Expense	.712	.538	.174	
Stripping	.529	0	.529	
Cost of Production	1.596	.565	1.031	
Exploratory	.607	.121	.486	
DEPRECIATION.				
Original Purchase	.803	.803		
Total Depreciation	.803	.803		
Taxes	.115	.038	.077	
Idle Expense	.054	0	.054	
Central Office	.059	.031	.028	
Supply Inventory	.001	0	.001	
Sundry Expense	.006	.005	.001	
Cost on Stockpile	3.241	1.563	1.678	
Loading & Shipping	.136	.114	.022	
Total Cost on Cars	3.377	1.677	1.700	
No.Days Operating	83	158		75
No.Shifts and Hours	1-10hr	1-10hr		
Avg.Daily Product	103	303		200

SOUTH JACKSON MINE.

COMPARATIVE WAGES AND PRODUCT.

	1 9 1 8.	1 9 1 7.	INCREASE.	DECREASE.
PRODUCT	15,879	47,836		31,957
No.Shifts and Hours	1-10hr	1-10hr		
AVERAGE NUMBER MEN WORKING				
Surface	4	4		
Underground	7	22		15
Total	11	26		15
AVERAGE WAGES PER DAY				
Surface	4.76	3.86	.90-23%	
Underground	4.36	3.24	1.12-34%	
Total	4.58	3.34	1.24-37%	
WAGES PER MONTH OF 25 DAYS				
Surface	119.00	96.50	22.50	
Underground	109.00	81.00	28.00	
Total	114.50	83.50	31.00	
PRODUCT PER MAN PER DAY				
Surface	11.83	36.71		24.88
Underground	7.90	7.61	.29	
Total	4.74	6.30		1.56
LABOR COST PER TON				
Surface	.416	.105	.311	
Underground	.551	.425	.126	
Total	.967	.530	.437	
TOTAL NUMBER OF DAYS	1,342	1,303	39	
Underground	2,008	6,266¾		4,258¾
Total	3,350	7,569¾		4,219¾
AMOUNT FOR LABOR				
Surface	6,608.21	5,032.24	1,575.97	
Underground	8,751.39	20,308.80		11,557.41
Total	15,359.60	25,341.04		

Proportion Surface to Underground Men:

1918 - 1 to 1.75
1917 - 1 to 6.5
1915 - 1 to 5.
1914 - 1 to 13.

NORTH JACKSON - 1918.

During the year diamond drilling was conducted between the North and South Jackson. This work has been reported under the South Jackson.

Old scrap iron, such as broken down cars, skips, buckets, and the like, which had been lying around the surface for years were sold.

LUCY MINE - 1918.

During the year a force was employed stripping on the North and South sides of the Lucy Pit which adjoins the South Jackson property. In December the steam shovel cut through from the South Jackson into the Lucy Pit.

Mining operations by the open pit method can start here at any time.

All old scrap iron lying about the surface was picked up and sold during the Summer.

MORRIS LLOYD MINE.

GENERAL

Operations at this property have been carried on to capacity, measured only by the labor conditions, during the entire year and a greater tonnage has been mined and shipped than during the year preceeding. We also show the largest tons per man this year than for any previous year in the history of the property.

The only new work undertaken on surface during the year was the commencement of the erection of twelve new tenement houses in our location, these were started late and very slow progress has been made due to shortage of labor.

Underground conditions are about the same as at the close of last year. The only new work was the completion of the sinking of the Morris Shaft to the 6th level and the installation of the storage pocket and pumping plant on that level.

During the past summer the balance of the ore from the open pit, which could be mined by open pit milling, was taken out and this ore body will hereafter be mined by the regular slicing and caving methods.

The labor problem has been acute all the year but we were fairly successful in maintaining an average crew of within 15 men with which we commenced the year. Our new Club House has been of wonderful assistance in holding what men we had.

The influenza epidemic did not hit us very hard and only about a dozen of our men were afflicted. One of our best miners died and also the wife of one of our pumpmen; these were the only deaths.

A Ford Auto Truck was purchased at the beginning of the summer and proved very useful and time saving in trucking between the mines and town.

MORRIS-LLOYD MINE.

LABOR

There has been no time during the year when we had a full compliment of men consequently operations could not be crowded and proper efficiency secured.

The following statement shows the total number of men employed each month on surface and underground for the past year and the four previous years for comparision, - Viz:

MEN EMPLOYED.

	SURFACE					UNDERGROUND					TOTAL				
	1914	1915	1916	1917	1918	1914	1915	1916	1917	1918	1914	1915	1916	1917	1918
JAN.	50	48	64	49	50	215	203	242	240	208	265	251	306	289	258
FEB.	43	49	59	47	47	197	200	245	230	194	240	249	304	277	241
MAR.	44	53	62	51	46	222	214	253	230	201	266	267	315	281	247
APR.	42	47	62	46	40	195	188	247	229	184	237	235	309	275	224
MAY.	48	50	61	44	48	207	216	240	220	198	255	266	301	264	246
JUN.	46	54	60	44	39	213	201	237	216	202	259	255	297	260	241
JUL.	44	54	65	43	41	190	194	232	207	201	234	248	297	250	242
AUG.	42	63	61	42	45	189	197	225	187	195	231	261	286	229	240
SEP.	45	56	59	46	44	197	210	210	177	186	242	266	269	223	230
OCT.	46	58	55	45	48	203	206	219	181	182	249	264	274	226	230
NOV.	38	57	53	48	47	172	217	216	174	164	210	274	269	217	212
DEC.	43	57	48	41	48	186	234	222	176	174	229	291	270	217	222
AVG.	44	54	59	45	45	199	207	232	206	191	243	261	291	251	236

Our labor costs per ton will average only about 15% higher than last year in spite of the fact that there was an increase of 30% in wages, this is due to the larger product per man received during the past year.

The labor costs per ton for this year and the previous four years are as follows, - Viz:

MORRIS-LLOYD MINE.

LABOR
(CONTINUED)

COST PER TON FOR LABOR.

	SURFACE					UNDERGROUND					TOTAL				
	1914	1915	1916	1917	1918	1914	1915	1916	1917	1918	1914	1915	1916	1917	1918
JAN.	.167	.205	.228	.180	.225	.868	1.027	1.043	.946	1.036	1.035	1.232	1.271	1.126	1.261
FEB.	.159	.211	.219	.178	.237	.868	1.003	1.072	.888	1.017	1.027	1.214	1.291	1.066	1.254
MAR.	.157	.175	.175	.173	.193	.957	.844	.831	.853	.952	1.114	1.019	1.006	1.026	1.145
APR.	.172	.181	.189	.172	.205	.971	.878	.836	.876	.985	1.143	1.059	1.025	1.048	1.190
MAY.	.159	.160	.180	.159	.202	.873	.856	.757	.897	.927	1.032	1.016	.937	1.056	1.129
JUN.	.159	.169	.161	.176	.166	.842	.755	.702	.960	.907	1.001	.924	.863	1.136	1.073
JUL.	.234	.151	.180	.166	.181	1.183	.673	.722	.907	.904	1.417	.824	.902	1.073	1.085
AUG.	.188	.20	.161	.170	.212	.937	.753	.671	.851	.992	1.125	.953	.832	1.021	1.204
SEP.	.203	.163	.182	.198	.212	.996	.746	.700	.869	.985	1.199	.909	.882	1.067	1.197
OCT.	.168	.164	.174	.229	.213	.891	.74	.735	.954	.980	1.059	.904	.909	1.183	1.193
NOV.	.195	.163	.187	.232	.354	.878	.772	.798	.977	1.335	1.038	.935	.985	1.209	1.689
DEC.	.167	.173	.173	.254	.333	.873	.853	.840	1.077	1.311	1.040	1.026	1.013	1.331	1.644
AVG.	.172	.174	.184	.186	.229	.92	.811	.809	.908	1.027	1.092	.985	.993	1.094	1.256

Three increases in wages were made during the year: 15% on April 1st; 10% on August 1st and 10% on October 1st.

On October 1st the eight hour day was adopted as a basic day on surface and for all work and the wages computed on an hourly basis allowing rate and one-half for each hour worked over eight hours. We continue to work the regular 10 hour day on surface.

The following statement shows the average daily wages for each month during the past year and the previous four years, Viz:

	SURFACE					UNDERGROUND					TOTAL				
	1914	1915	1916	1917	1918	1914	1915	1916	1917	1918	1914	1915	1916	1917	1918
JAN.	2.47	2.25	2.48	3.19	3.86	2.97	2.65	2.99	3.51	4.36	2.88	2.57	2.89	3.45	4.26
FEB.	2.44	2.23	2.69	2.96	3.89	2.96	2.61	3.15	3.52	4.36	2.86	2.53	3.06	3.46	4.26
MAR.	2.43	2.23	2.70	3.16	3.85	2.95	2.66	3.12	3.53	4.41	2.87	2.57	3.03	3.47	4.30
APR.	2.40	2.22	2.74	3.10	4.02	2.92	2.70	3.05	3.53	4.64	2.83	2.61	2.98	3.44	4.52
MAY.	2.31	2.23	2.91	3.40	4.22	2.92	2.63	3.16	3.88	4.86	2.81	2.64	3.12	3.80	4.74
JUN.	2.49	2.28	2.91	3.42	4.21	2.88	2.74	3.20	3.90	4.91	2.81	2.65	3.12	3.81	4.78
JUL.	2.47	2.20	2.90	3.39	4.23	2.89	2.69	3.17	3.98	4.98	2.81	2.58	3.09	3.87	4.89
AUG.	2.48	2.51	2.89	3.43	4.70	2.81	2.98	3.18	4.05	5.52	2.75	2.87	3.11	3.93	5.36
SEP.	2.51	2.46	2.88	3.44	4.82	2.63	3.03	3.17	4.16	5.53	2.76	2.91	3.12	4.00	5.39
OCT.	2.21	2.38	2.91	3.86	5.32	2.68	3.03	3.19	4.42	6.11	2.55	2.89	3.14	4.29	5.97
NOV.	2.21	2.47	2.91	3.83	5.38	2.68	3.07	3.23	4.37	6.04	2.60	2.94	3.16	4.28	5.89
DEC.	2.22	2.45	3.04	3.88	5.23	2.70	2.97	3.37	4.34	5.94	2.61	2.87	3.31	4.25	5.79
AVG.	2.39	2.33	2.83	3.44	4.48	2.85	2.83	3.17	3.93	5.14	2.77	2.72	3.10	3.84	5.01

MORRIS-LLOYD MINE.

LABOR
(CONTINUED)

On account of the shortage of men it has been somewhat difficult to prosecute our work efficiently and get things done due to the unskilled character of a large proportion of the labor employed.

The following statement shows the men of the different nationalities at work at the mine in December month and for the same month during the previous two years, Viz:

	1918	1917	1916
Americans,	60	57	65
English,	10	13	12
Swedish,	9	10	13
French,	10	11	22
Finnish,	87	83	118
Italian,	45	51	45
Greeks,	2	1	3
Slavish,	1	0	0
TOTAL,	224	226	278

PRODUCTION.

During the year we produced 289,500 tons as compared with 284,000 tons last year.

The production was made up of the following grades, Viz:

MINE.	BESSEMER	MORRIS	SILICA	LLOYD	LLOYDDALE	TOTAL
Morris	25,112	16,320	7,712			49,144
Lloyd	5,597		34,210	141,144	59,405	240,356
TOTAL,	30,709	16,320	41,922	141,144	59,405	289,500
" 1917	55,772	9,530	52,848	138,235	27,615	284,000
" 1916	75,024	2,630	76,350	112,119	41,562	307,685

MORRIS-LLOYD MINE.

PRODUCTION
(CONTINUED)

The total tonnage this year, was hoisted through our shafts and of this total, 58,020 tons were milled from our open pit, and trammed to an hoisted at our Lloyd Shaft.

Ore was hoisted on 297 days during the year, at the rate of 975 tons per day as compared with 302 days at 886 tons per day last year.

We were forced to shut down several days in the month of February on account of low water at the Power Plant and also lost several days on account of Peace Celebrations.

We show the largest tons per man per day this year than for any year in the history of the property which is due to the tonnage mined through our open pit which was rapidly won without timbering.

The following statement shows our average tons per man per day for each month and year for 1918 and the four previous years for comparison, Viz:

TONS PER MAN PER DAY.

	SURFACE					UNDERGROUND					TOTAL				
	1914	1915	1916	1917	1918	1914	1915	1916	1917	1918	1914	1915	1916	1917	1918
JAN.	14.87	10.98	10.86	17.75	17.09	3.43	2.58	2.87	3.71	4.20	2.78	2.09	2.27	3.07	3.37
FEB.	15.31	10.54	12.29	18.04	16.36	3.41	2.60	2.94	3.96	4.29	2.79	2.09	2.37	3.25	3.40
MAR.	15.49	12.74	15.38	18.37	19.80	3.08	3.15	3.75	4.14	4.63	2.57	2.53	3.02	3.38	3.75
APR.	13.97	12.26	14.50	17.88	19.60	3.00	3.08	3.64	4.02	4.71	2.47	2.46	2.91	3.28	3.80
MAY.	14.47	13.91	16.50	21.43	20.84	3.35	3.20	4.17	4.33	5.25	2.72	2.60	3.33	3.60	4.20
JUN.	15.68	13.54	17.86	19.28	25.18	3.42	3.63	4.56	4.06	5.42	2.81	2.86	3.63	3.36	4.46
JUL.	10.58	14.51	15.64	20.25	24.80	2.44	4.00	4.39	4.39	5.50	1.98	3.13	3.43	3.61	4.50
AUG.	13.21	12.49	17.64	20.09	22.37	3.00	3.97	4.74	4.75	5.56	2.44	3.01	3.73	3.84	4.45
SEP.	12.25	15.15	16.04	17.36	22.96	2.84	4.06	4.53	4.79	5.61	2.30	3.20	3.53	3.75	4.51
OCT.	13.16	14.48	17.00	16.76	25.35	2.95	4.10	4.33	4.63	6.23	2.41	3.20	3.45	3.63	5.00
NOV.	13.82	15.12	15.56	16.92	15.31	3.06	3.97	4.04	4.47	4.52	2.50	3.15	3.21	3.54	3.49
DEC.	13.30	14.13	17.57	15.28	15.81	3.09	3.48	4.01	4.04	4.53	2.51	2.79	3.26	3.20	3.52
AVG.	13.86	13.38	15.57	18.51	20.45	3.09	3.48	4.00	4.29	5.04	2.53	2.76	3.18	3.48	4.04

MORRIS LLOYD MINE.

SHIPMENTS

Shipments for the year totaled 315,540 tons.

The following statement shows shipments by grades for the past three years, Viz:

	1916 TONS	1917 TONS	1918 TONS
Morris Bessemer,	52,275	59,620	23,785
Lloyd Bessemer,	3,777	26,809	2,679
TOTAL BESSEMER,	56,052	86,429	26,464
Morris Ore,	5,433	14,050	13,576
Lloyd Ore,	134,928	126,753	155,166
Lloyddale Ore,	31,786	19,280	60,087
TOTAL NON BESSEMER,	172,050	160,083	228,829
Morrisville,	389	10,930	11,878
North Lake Silica,	111,107	45,813	48,369
TOTAL SILICA,	111,496	56,743	60,247
GRAND TOTAL,	339,598	303,255	315,540

Of the total 198,413 tons were shipped from pocket and 117,127 tons from stockpile.

ORE IN STOCK.

We show a smaller balance in stockpile at the close of the year than last year. Balances are as follows, Viz:

BALANCES IN STOCKPILES DECEMBER 31st, 1918.

MINE	BESSEMER	MORRIS	SILICA	LLOYD	LLOYDDALE	TOTAL
Morris,	2,669	10,571	10,446			23,686
Lloyd,			3,757	21,992	23,424	49,173
TOTAL 1918,	2,669	10,571	14,203	21,992	23,424	72,859
TOTAL 1917,	7,261	3,769	32,903	31,006	23,960	98,899
TOTAL 1916,	61,251	333	37,077	3,866	15,526	118,152

MORRIS LLOYD MINE.

COSTS OF PRODUCTION

The following table shows -

PRODUCT MONTHLY, PER MAN PER DAY AND COSTS, WITH

COMPARISONS FOR PREVIOUS YEARS, TAKEN FROM

COST SHEETS.

1918	PRODUCT	TONS PER MAN	TOTAL COST OF PRODUCTION			COST PER TON		
	TONS.	PER DAY	LABOR	SUPPLIES	TOTAL	LABOR.	SUPP.	TOTAL
JAN.	22,545	3.37	28,513.17	11,269.18	39,782.35	1.264	.501	1.765
FEB.	19,180	3.40	24,321.65	10,562.44	34,884.09	1.268	.551	1.819
MAR.	23,186	3.75	27,075.56	9,977.43	37,052.99	1.168	.430	1.598
APR.	21,849	3.80	26,624.77	10,140.50	36,765.27	1.219	.464	1.683
MAY.	27,304	4.20	31,164.98	12,293.37	43,458.35	1.141	.451	1.592
JUN.	26,819	4.46	29,652.80	15,691.64	45,344.44	1.106	.585	1.691
JUL.	28,740	4.50	31,584.07	17,966.11	49,550.18	1.099	.625	1.724
AUG.	28,040	4.45	34,042.61	14,010.51	48,053.12	1.213	.500	1.713
SEP.	24,768	4.51	29,859.36	10,749.15	40,608.51	1.206	.434	1.640
OCT.	30,656	5.00	33,844.48	15,263.68	49,108.16	1.200	.618	1.818
NOV.	17,327	3.49	29,636.99	11,797.57	41,434.56	1.710	.681	2.391
DEC.	19,086	3.52	31,683.28	14,097.19	45,780.47	1.660	.738	2.398
ADJUSTMT				20,559.56	20,559.56			
TOTAL-18	289,500	4.04	358,003.72	174,378.33	532,382.05	1.237	.602	1.839
TOTAL-17	284,000	*1-3.48	297,870.77	125,041.62	422,912.39	1.113	.467	1.580
TOTAL-16	307,685	*2-3.18	257,025.03	139,995.37	397,020.40	.911	.501	1.412
TOTAL-15	221,585	2.76	178,145.41	97,464.12	275,609.53	.804	.440	1.244
TOTAL-14	192,145	2.53	193,822.98	103,064.08	296,887.06	1.010	.535	1.545

*1 - 1917 Cost of Production and tons per man per day do not include 16,213 tons mined from open pit by Steam Shovel method.

*2 - 1916 Cost of Production and tons per man per day do not include 25,852 tons taken from open pit by Steam Shovel method.

MORRIS LLOYD MINE.

ESTIMATE OF PRODUCTION.

Our estimate of production for the coming year is:-

300 days at 900 tons per day, 270,000 tons.

The following statement shows the result of development and production during the past and previous years, Viz:

Estimated Ore	1912	1913	1914	1915	1916	1917	1918
In mine Jan. 1st,	3,060,000	2,861,000	3,218,750	3,089,200	2,081,600	2,575,577	2,267,116
Product,	142,339	176,080	192,145	221,585	307,685	284,000	289,500
Balance,	2,917,661	2,684,920	3,026,625	2,867,615	1,773,915	2,291,577	1,977,616
In mine Dec.31st,	*2,861,000	**3,218,750	3,089,200	2,081,600	2,575,577	2,267,116	2,185,771
Dev. Fiscal Year,	** 56,661	533,830	62,575	## 786,015	801,662	** 24,461	208,155

* No estimate made for Morris Mine in 1912.
** Shows a loss.
** 700,750 tons estimated for Morris Mine.
** Section 6 ore body reduced 603,200 tons.

OPEN PIT

The work of milling the ore in the open pit on Section 6 was commenced in April month and completed in October and a total of 58,020 tons were removed from this territory. Part of this ore was mined and cast into the mills by a small revolving shovel which we placed in the pit to handle the ore after it had been broken by the miners.

The South wall of this pit was very unstable and several caves were experienced during the summer but no accidents occurred.

The bottom of the pit has been completely covered over with poles and lagging and after the ore remaining along the sides has been taken the walls will be blasted in to form a mat, after which slicing in the regular way will be carried on.

OPEN PIT
(CONTINUED)

The tonnage from here was cheaply mined compared with underground workings and as soon as ore stopped coming from this place the loss was reflected in our production and costs.

We mined a total of 100,085 tons from this open pit during 1916, 1917 and 1918.

MINE BUILDINGS

Our mine buildings required very little attention during the year and the only cost for maintenance of importance was for reapairs to our Section 6 headframe which were made necessary due to the brakeman pulling the cage up to the head shieve and breaking some of the timbers. This cost approximately $200.00

DWELLINGS

Our dwelling houses are all in good condition. Some of them will require painting in the near future.

We continue to clean up the alleys in the location and try to impress on the people the necessity of keeping things clean.

The cess-pools continue to be a source of annoyance and expense in keeping them pumped out and in a sanitary condition.

We have five empty houses at present and no applications on hand.

DWELLINGS
(CONTINUED)

We closed last year with every house occupied and, therefore, early in the spring we asked for twelve new dwellings for this location. The E. &. M. was made out but was not approved until late and then there was delay in letting the contract after which there was delay in the contractor getting started, consequently only the sheds for the houses have been erected and a few of the foundations have been laid. None of the houses have as yet been started.

Now that the war is over we hope to be able to increase our forces and secure more men with families to come here.

STORE BUILDING

This store building was erected last year and was opened on January 2nd, 1918 by Mr. J. B. Casper. The business seems to have prospered during the year and the convenience of a store in the location is appreciated by our people.

During the past summer a forty foot extension was added to the store building to provide warehouse room and the rent advanced from $50.00 to $60.00 per month.

WELFARE WORK

The practice of giving prizes for gardens and best kept premises has been continued and interest is shown by our tenants in caring for their premises.

WELFARE WORK
(CONTINUED)

During the past summer we provided land in addition to the ground around the house, for our men to plant potatoes and other vegetables. This was quite generally accepted. Each man was provided with a lot containing 15,000 square feet and a good crop was harvested.

The Club House erected last year was opened early in January month and has proven a great success. It has been used by all of our people and has been a wonderful help to us in holding what men we had under the exceptional labor conditions brought on by the war.

On January 30th a fire occurred in this building which destroyed the interior of the wing containing the billiard and pool tables and it required several months to make repairs. This did not close the building as we continued to use the other rooms while repairs were underway. Moving picture shows are given three evenings each week and these just about pay for themselves. The Pool and Bowling shows a good revenue and are popular.

DOCKS, TRESTLES AND POCKETS

We have been to no great expense on account of our Trestles and Pockets during the year and only the regular maintenance charges have been necessary.

It will be necessary to extend the Morris rock trestle during the coming spring in order to care for the large tonnage of rock expected from this shaft.

DOCKS, TRESTLES AND POCKETS

(CONTINUED)

We have made a change this year in our stocking trestle at the Lloyd Mine and have erected two two leg trestles with 8 ft. caps in place of one three leg trestle with a 20 ft. cap. This new arrangement works out much better than the old as it permits us to dismantle part of our stocking equipment while the balance remains in work to take care of the shaft product when railway cars are not available during the shipping season. Another good point is that we can erect one of these trestles while the ore is being removed from the other and in that way provide stocking facilities for use at all times.

TOP TRAM ENGINE AND CARS

A new 50 H.P. Motor was installed at the Morris Top Tram during the year to replace a 25 H.P. which was too small for the work. We also rebuilt one of the large top tram cars for this work.

We have been under heavy maintenance charges on account of repairs rewinding armatures etc., and new gears and pinions to replace those broken.

TRACKS AND YARDS

The cost maintaining the Railway Tracks in our yards was saddled on the mines this year and the Railway Company has been billing us with heavy charges for work thereon.

The usual amount of surface work cleaning and maintaining ditches etc., has been necessary.

HOISTING MACHINERY

We have made some heavy charges to this account during the year although few repairs have been necessary and all of our hoisting machinery is in excellent condition.

A new steel gear and pinion was placed on the Lloyd hoist in May month at a cost of $584.68.

We installed 403' feet of 12" counter-weight pipe in the Morris Shaft on account of sinking this opening deeper during the year. We also added three 1700 ft. hoisting ropes at this shaft for the same reason.

One new 8' Top Shieve was placed during the year. We also added new ropes at the Lloyd shaft during the year and it will be noted we show exceptionally heavy charges for ropes for this period. This is due, in a measure, to the fact that we had to replace the ropes at the Morris shaft with those of greater length and take off ropes not yet worn out. We have several servicable ropes on hand which will be used prior to again purchasing.

PUMPS

We have been subjected to heavy charges on account of our mine pumps during the year.

The pumping plant on the 6th level of the Morris mine had to be completely changed and a new sump provided and pumps moved. The pump sump was located in direct line of shaft and when this opening was brought to the level the pump had to be moved.

We also provided a new gear and pinion for No. 1 Main pump at a cost of $1,845.30, to replace one broken.

PUMPS.
(CONTINUED)

The cost of cleaning our main pump sump has always been heavy and also difficult as it was hard to get men to go into this mud to work, we have therefore put up a raise from the skip compartment to hole into the sump and have provided a pipe and valve control to carry the mud direct to the skip where it will be hoisted to surface. This is working out very satisfactorily and makes for a large saving.

MINE VENTILATION

We are opened up so thoroughly underground that natural ventilation has proven adequate and we have been put to practically no expense on this account during the year.

During the coming year it will be necessary to maintain forced ventilation in the long drift we are to extend west across leases #24 and 25 on the 6th level of the Morris Mine.

ELECTRIC TRAM PLANT

One new 6 ton electric locomotive was purchased during the year and placed in work on the 3rd level Lloyd Mine. This was necessary asone locomotive could not handle the product over the long tram from the east end of Section 6 workings.

We also purchased 17 new four ton side dump cars during the year some of which were placed in use on the 3rd level Lloyd mine and the balance on the 6th, or bottom level of the Morris Mine.

MORRIS LLOYD MINE.

CRUSHING PLANT.

Our Crusher at the Lloyd Mine was operated all through the year, both winter and summer, on ores to Charcoal furnaces and no trouble or delays were encountered.

During the summer months ores from stockpile were sent to the Maas crusher at Negaunee.

UNDERGROUND TRACKS AND CARS

Only the regular maintenance charges have been necessary here during the year and our charges are less than last year in spite of the increases in labor and supplies.

WATER SUPPLY

The water supply for location and mine buildings all comes from the Carp River and during the year we had to install a new suction line from pump in Machine shop to the intake on account of the Morris rock pile extending to a point south where it endangered the old suction pipe.

We also repaired the centrifugal pump used in this work.

MINE TIMBER AND LAGGING

Our supply of Mine timber has been adequate all through the year. Contracts for the coming year show a large increase in cost over last and will tend to materially increase our timbering cost, which is a heavy item with us.

MORRIS LLOYD MINE.

PERSONAL INJURIES

We are pleased to again be able to report no fatal or serious accidents during the year. We have had a total of 45 accidents during the past twelve months only two in which the men suffered any but minor injuries.

On January 2nd Napoleon Peppin lost three fingers by having his hand drawn into a small shieve while hoisting timber in a raise underground and on May 21st, William Estala suffered a broken leg from a fall of ground in a drift while he was placing a set of timber.

ACCIDENTS TO EQUIPMENT

In February month the top tram motor at the Morris Mine burnt out and we suffered two days delay while a larger motor was being secured and installed.

On September 17th the brakeman at our Section six shaft hoisted the cage, loaded with men, to the top shieve breaking some of the timbers and pulling the head frame out of line. No one was injured.

We have had but few minor delays during the year and no great trouble has been experienced.

STEAM SHOVEL LOADING

Loading by steam shovel was intermittant all through the summer and frequent moving of the shovel was necessary in order to provide the proper mixtures. Some of the piles were badly frozen and had to be blasted. During the season we loaded a total of 117,127 tons at a cost of .062 per ton.

MORRIS LLOYD MINE.

TAXES

The valuations on both the Morris and Lloyd Mines were largely increased by the State Tax Commission consequently our taxes this year are the highest they have ever been in the history of the property.

The following statement shows the taxes, cost per ton on production and shipments - for the past year and for the previous three years, Viz:

	1915		1916		1917		1918	
	VALUATION	AMOUNT	VALUATION	AMOUNT	VALUATION	AMOUNT	VALUATION	AMOUNT
LLOYD MINE.								
Realty	93460.00	1983.61	93460.00	2301.21	328613.00	9697.01	1139776.00	25032.19
Personal	108113.00	2291.98	93171.00	2295.78	289291.00	8379.87	291,639.00	6406.04
Section 6	390780.00	8293.86	429858.00	10584.18				
TOTAL LLOYD	592353.00	12569.55	616489.00	15181.17	617904.00	18076.88	1431415.00	31438.23
MORRIS MINE								
Realty	100000.00	1791.60	75000.00	1180.94	190810.00	3108.54	327361.00	6146.86
Personal	63958.00	1145.87	60704.00	955.83	229021.00	3731.05	119322.00	2240.02
TOTAL MORRIS	163958.00	2937.47	135704.00	2137.77	419831.00	6839.59	446683.00	8386.88
GRAND TOTAL,	756311.00	15507.02	752193.00	17317.94	1037735.00	24916.47	1878098.00	39825.11
PRODUCT-TONS		221,585		307,685		284,000		289,500
TAXES PER TON PRODUCED		.069		.056		.0877		.1376
SHPMTS-TONS		276,521		339,597		303,253		315,540
TAXES PER TON SHIPPED		.056		.051		.0822		.1262

ROCK DRIFTING

On account of the scarcity of men very little rock development was undertaken during the year and we drifted but 442 feet in rock during the past twelve months.

We have two long rock drifts planned for the coming year, one to the west across Chase-Moore leases numbers 24 and 25 and another from the Morris Shaft, on the 6th level, to the supposed extension of the ore body on Section 6.

UNDERGROUND
MORRIS MINE

THIRD LEVEL

We continue slicing and caving in the two lenses west of the shaft below this elevation. The product being dropped through and trammed to the shaft on the 4th level.

The West lens is a little wet in places and we have been unable to keep men at work here all of the time. We have two gangs at work at the close of the year and we hope under better labor conditions to make more progress in getting out the ore and increase our production from this territory, particularly, in view of the fact that it is desirous to get as large a tonnage from the Chase lease as is possible. All of this west lens is on Chase lease No. 9.

FOURTH LEVEL

No ground was broken on this level during the year and the only work underway here was the caring for the product coming down from above.

SIXTH LEVEL

During the year the main level was extended west to the point penetrated by surface diamond drill hole No. 4 without encountering any ore bodies of size. Some bunches of ore were cut and a large dike encountered. Diamond drilling was placed underway and is still in progress from the west end of this level.

The main level will now be extended west across leases No. 24 and 25, in the slate footwall, from which diamond drilling will be done to prove the ground on these leases.

UNDERGROUND
MORRIS MINE

SIXTH LEVEL
CONTINUED

The small amount of ore shown, by Diamond Drill hole No. 96 is now being prepared for mining.

Mining is underway above this level, in the ore on Chase lease No. 9 encountered in diamond drill hole No. 31. A raise has been put up from this level a distance of 400 feet and holed through to the 4th level. This raise was in ore except for a distance of 100 feet and it is supposed ore will be found south of where the rock was encountered.

A raise was also put through from this 6th level to the 4th level in the first lens of ore south-west of the shaft. This was in lean material all the way and is a disappointment as it was supposed this would be a continuation of the high grade ore now being mined above the 4th level.

SINKING MORRIS SHAFT

The work of sinking this shaft from the 4th to the 6th level, a distance of 400 feet was completed during the year and the pocket cut and built. Hoisting is now underway from here.

We plan on sinking this shaft another left, approximately 330 feet below the present bottom, reaching the bottom of the ore found in diamond drill hole No. 29.

UNDERGROUND
MORRIS MINE

DIAMOND DRILLING

Hole No. 41, which is being drilled vertically at a point approximately 560 feet south of the footwall and which at the close of last year was 651 feet deep, has been drilled to a total depth of 1513 feet without encountering any ore. It is proposed to drill this hole to the footwall. At present the hole has been stopped and the men used elsewhere.

During the year holes No. 42,43,44,45, 46 and 47 have been drilled at the west end of the 6th level, Morris Mine, all of them except Nos. 42 and 44 show some ore.

It is proposed to drill another hole vertically at a point 140 feet east of the breast of the main level.

LLOYD MINE

SECOND LEVEL

A small amount of Silica ore remaining on this level was taken out during the past year and the only work now underway on this elevation is the handling of mine timber and tools to the workings between this and the 3rd level.

THIRD LEVEL

Slicing and caving has been underway above this elevation all the year. The ground is fully developed, dry, and working conditions ideal, and a good product is being secured.

We have had several falls of ground in this territory as the formation stands on end and becomes heavy.

UNDERGROUND
LLOYD MINE

FOURTH LEVEL

We have had four gangs at work in the ore above this level during the first eleven months of the year but in December two gangs were taken out and transferred to the ore body on Chase lease No. 9 in order to expedite mining operations at that point. One gang has a few months work to take out the balance of the ore on the slice they are now working after which they will be moved and work in this territory discontinued until the ore body has been worked down from above.

SECTION 6

FIRST SUB (1455')

Nos. 18, 19 and 20 are slicing and caving underneath the hanging west of the open pit. The ore is only about a drift wide in places but is widening out as we drop down. Some of the ore in this territory is high in phosphorus but it is all worked into our regular grades.

SECOND SUB (1305')

&THIRD SUB (1155')

The men from this territory were used in the open pit during the summer months due to a shortage in labor. They are now back and the work of developing the ore is being pushed.

The west ore lens has been followed up from the 4th level to a point just west of the 1455' sub elevation and is now being prepared for mining.

No. 12 is driving a drift from the main raise to permit of dumping ore direct to the 3rd level and do away with transferring.

MORRIS LLOYD MINE.

UNDERGROUND
SECTION 6

SECOND SUB (1305')
&THIRD SUB (1155')
(CONTINUED)

On account of the many small lenses of ore in this territory the cost of mining is high and the tons per men low.

FOURTH SUB

Nos. 17 has developed a larger tonnage of ore on this elevation than was expected and our estimate has been increased for this territory over last year.

No. 42 continues slicing and caving in their ore body the same as last year. This is a medium sized lens of ore lying between two dikes and great care must be exercised in mining in order to keep the product clean.

Now that the open pit mining has been completed we can work more men slicing and caving in the main section six ore body and we hope the labor situation will be such as to enable us to work this territory to its capacity.

MORRIS LLOYD MINE.

ORE IN SIGHT DECEMBER 31st, 1918.

Following is an estimate of ore in the mine as of December 31st, 1918, calculating a deduction of 20% for rock and loss in mining, Viz;

MORRIS MINE

LOCATION	BESSEMER	MORRIS ORE	TOTAL
Above 4th Lev.(Chase Lease #9)	31,693	31,694	63,387
" " " (E.I.Co. Land)	54,658	54,658	109,316
" 6th " (")		81,442	81,442
" " " (Chase Lease #9)		109,601	109,601
" " " (" " #24)		21,466	21,466
PROSPECTIVE ORE.			
Shown by Drill Hole No. 36 below 6th Level (E.I.Co.)		72,534	72,534
Shown by Drill Holes Nos. 29, 32 and 34, below 6th Level,(E.I.Co)		28,534	28,534
Ore above 4th Level, (E.I.Co.)	1,562	521	2,083
PROSPECTIVE,(CHASE LEASE #9)			
Above 6th Lev.(Floor of 4th Lev.)		708	708
Below " " (Contract #28)		6,520	6,520
" " " Shown by #36 D.D.H.		21,334	21,334
PROSPECTIVE,(CHASE LEASE #24)			
Below 6th Lev.(Shown by D.D.Holes #42,43,44,45 Undg.& #4 Surface		41,083	41,083
Shown by Drills Holes #46 & 47.		12,302	12,302
Floor of 6th Level,		555	555
TOTAL ORE, MORRIS MINE.	87,913	482,952	570,865

LLOYD MINE.

LOCATION	LLOYD ORE	LLOYDDALE	TOTAL
Above 3rd Level,	145,332	104,143	249,475
PROSPECTIVE ORE.			
Below 3rd Level,		6,111	6,111
TOTAL LLOYD MINE.	145,332	110,254	255,586

MORRIS LLOYD MINE.

ORE IN SIGHT DECEMBER 31st, 1918.
(CONTINUED)

SECTION 6

LOCATION	LLOYD ORE	LLOYDDALE	TOTAL
Above 1455 Ft. Sub	61,412	20,470	81,882
" 1305 Ft. "	5,844	256,495	262,339
" 1155 Ft. "	34,322	169,896	204,218
" 1055 Ft. "	11,030	70,654	81,684
" 3rd Level	37,209	133,367	170,576
" 4th "	112,632	332,795	445,427
PROSPECTIVE ORE			
Above 1055 Ft. Sub	1,500	3,500	5,000
Above 4th Level	2,208	5,152	7,360
Below 4th "		100,834	100,834
TOTAL SECTION SIX,	266,157	1,093,163	1,359,320

SUMMARY OF TOTAL ORE

MINE	BESSEMER	LLOYD & MORRIS	LLOYDDALE	TOTAL
Morris,	87,913	482,952		570,865
Lloyd,		145,332	110,254	255,586
Section 6,		266,157	1,093,163	1,359,320
GRAND TOTAL,	87,913	894,441	1,203,417	2,185,771

Total ore on Chase Lease No. 9	201,550
" " " " " " 24	75,406
" " " Company Lands,	1,908,815
GRAND TOTAL,	2,185,771

MINE BUILDINGS

The mine buildings at this property were all completed by the contractors during the year. The Engine House was not finished until December month. We must put in the concrete floor in this building and the work has been deferred until warm weather.

All of the buildings are of wood construction except the Engine House which is of brick on a concrete foundation.

DWELLINGS

The ten tenement houses were completed in the spring by the contractor and are now all occupied by our men.

During the summer a Captain's residence was built at this location and is occupied.

It is not planned to erect more houses here until we have reached the ore and proven its extent.

SCHOOL HOUSE

A small school building which was at the Dexter Mine has been moved to our location and is now in use. This is a one room building and proves ample to care for the number of children now on the location.

LABOR

We have had great difficulty in keeping men at work at this property during the year, and only those low in efficiency have been available. Now that peace has come we hope the situation will improve.

ROCK TRESTLE

A permanent rock trestle was erected running south from the shaft and a gravity tram installed to handle the rock from the mine. This arrangement permits us to handle all work at the head of the shaft with one man on each shift.

SHAFT HOUSE

The Steel Head Frame which had been in use at the old Chase Mine was reerected at this property by the Worden Allen Company. The work was done in February and march months. We placed the concrete pins for this headframe in January month.

HOISTING MACHINERY

Our main hoisting plant is being installed and all of this machinery is on the ground. We will be glad to get this new hoist as we are now getting down to such a depth that the work is proving heavy for the small temporary hoist now in use.

SHAFT SINKING

At the close of last year we had just succeeded in anchoring the shaft at 60 feet in solid ledge after passing through quicksand and broken ground.

SHAFT SINKING
(CONTINUED)

In January month the shaft was concreted from this point to surface in order to shut off the heavy flow of water coming in through large crevices in the rock. On account of the heavy flow of water it was not deemed advisable to place our concrete without relieving the pressure which would naturally set up back of same, therefore, bleeders were put in the shaft at different points and the water allowed to flow freely through same until the concrete had been placed above the mean water level. The shaft was kept pumped clear of water while concreting was in progress. After the concrete was poured it was permitted to set for four days, after which the bleeders were, with one exception, shut and the shaft allowed to fill with water. One bleeder pipe was equipped with a valve and a handle extending to the collar of shaft and after the water had reached its level the valve was closed. Sinking was then discontinued until the head frame could be erected and was started again on April 15th when the shaft was pumped out. It was found that the concrete had not set at points and the shaft was making considerable water. We were compelled grout in neat cement and in some cases tear out and reconcrete whole sections. We were successful in shutting off nearly all of the water in this way.

Sinking has not progressed as rapidly as expected due to shortage of men and the low average ability of those employed. We have also suffered delays on account of accidents to our hoist which is an old one.

SHAFT SINKING
(CONTINUED)

The ground has proven very unstable and we have been compelled to concrete as we progress which is proving slow and expensive. The ground has been so slabby at points that it has been difficult, without danger to the men, to displace sufficient ground to permit the placing of the sets.

At the close of the year the shaft has reached a depth of 624 feet and in addition to the sinking we have cut the first level plat at the 600' elevation and also made the excavation for the pocket on this level.

It is planned to sink this shaft to the 1080 foot elevation prior to commencing drifting to the ore measures.

MORRIS LLOYD MINE.

ANALYSIS OF COST SHEETS, EXPLAINING INCREASE OR DECREASE IN VARIOUS ACCOUNTS BETWEEN YEARS 1918 - 1917.

GENERAL EXPENSE

Engineering, Acct. 27,	Year 1918,	$1909.79	Cost per Ton	.007
	Year 1917,	2589.63	"	.010
	Decrease 1918,	679.84	"	.003

Decrease in this account is due to less engineering work necessary during last year as compared with 1917.

Analysis, Acct. 28,	Year 1918,	$7609.44	Cost per Ton	.026
	Year 1917,	6421.18	"	.024
	Increase 1918,	1188.26	"	.002

Increase in this account over 1917 is due principally to increase in wages and cost of chemicals and other laboratory supplies.

Personal Injury, Acct. 30,	Year 1918,	$4107.10	Cost per Ton	.014
	Year 1917,	2261.69	"	.008
	Increase 1918,	1845.41	"	.006

The increase for this year as compared with 1917 is due to increased compensation to Doctors and our proportion of loss in operating Ishpeming Hospital.

Mine Office, Acct. (a),	Year 1918,	$4218.98	Cost per Ton	.015
	Year 1917,	3447.37	"	.013
	Increase 1918,	771.61	"	.002

The increase in this account is due to the increase in salaries.

District Office, Acct. (b),	Year 1918,	$12117.75	Cost per Ton	.042
	Year 1917,	10826.36	"	.041
	Increase 1918,	1291.39	"	.001

The increase in this account is due to the increase in salaries.

SUMMARY GENERAL EXPENSE.

Year 1918,	$30648.09	Cost per Ton	.106
Year 1917,	25620.78	"	.096
Increase 1918,	5027.31	"	.010

The increase in General Expense is principally due to increase in salaries and compensation to Doctors and Ishpeming Hospital.

MAINTENANCE

Tracks & Yards, Acct. 125,	Year 1918,	$2193.41	Cost per Ton	.008
	Year 1917,	1498.61	"	.006
	Increase 1918,	694.80	"	.002

The increase in this account is due to the new ruling of the Railroad administrator in having the mines pay for the maintenance of side tracks around the mines.

Docks, Trestles and Pockets, Acct. 126,	Year 1918,	$408.17	Cost per Ton	.001
	Year 1917,	298.18	"	.001
	Increase 1918,	109.99	"	- -

During the year it cost more to maintain the pockets in the shaft house than the year previous but did not effect the cost per ton.

Buildings, Acct. 127,	Year 1918,	$420.81	Cost per Ton	.002
	Year 1917,	370.83	"	.001
	Increase 1918,	49.98	"	.001

The increase this year is due to repairs made on Section 6 Shaft House.

Shop Machinery, Acct. 128,	Year 1918	$277.73	Cost per Ton	.001
	Year 1917	162.32	"	.001
	Increase 1918,	115.41	"	- -

The increase in this account is due to the purchase of 4 sets of pipe dies for pipe cutter in machine shop.

Heating Plant, Acct. 129,	Year 1918,	$144.78	Cost per Ton	.001
	Year 1917,	271.75	"	.001
	Decrease 1918,	122.97	"	- -

The cost this year represents only the usual repairs to Heating Plants, the increase cost for 1917 being for considerable repairs made on the Section 6 heating boiler.

Hoisting Mach'y, Acct. 130,	Year 1918,	$7297.41	Cost per Ton	.025
	Year 1917,	4656.75	"	.017
	Increase 1918,	2640.66	"	.008

The increased cost this year is due to putting on 4-1700' new hoisting ropes at the Morris Shaft, and 3-1300' new ropes at the Lloyd Shaft, also 403' of 12" counterweight pipe at the Morris. The charges at the Morris were due to sinking the shaft an additional 400 feet. A new gear and pinion was placed on the Lloyd Hoist during the present year at a cost of $584.68. A new Top Shieve was also installed at a cost of $159.60

MAINTENANCE
(CONTINUED)

Compressor & Power Drills, Acct. 131,

Year 1918,	$ 50.75	Cost per Ton	.000
Year 1917,	918.08	"	.003
Decrease 1918,	867.33	"	.003

The decrease this year is due to the fact that very few repairs have been necessary on our compressors and no new equipment purchased.

Pumping Mach'y, Acct. 132,

Year 1918,	$8789.90	Cost per Ton	.03
Year 1917,	3539.12	"	.013
Increase 1918,	5250.78	"	.017

The increase in this account is for 2 new Herring bone gear and pinions for the large Prescott Pumps in Morris mine, costing $3145.30 and also the cost of raising up from Morris shaft under the sump. This raise is used to run out the mud that accumulates in bottom of sump. The entire pumping plant on the 6th level also was moved and a new sump for same cut in 1918.

Top Tram Eng. and Cars, Acct. 133,

Year 1918,	$4389.24	Cost per Ton	.015
Year 1917,	1496.68	"	.006
Increase 1918,	2892.56	"	.009

The increase in this account is due to the purchase of one 50 H.P. Motor for Morris Mine and 3400 ft. 5/8" Wire Rope, also for rewinding armatures repaired at the Hard Ore Shops.

Skips and Skip Roads, Acct. 134,

Year 1918,	$1404.80	Cost per Ton	.005
Year 1917,	987.40	"	.004
Increase 1918,	417.31	"	.001

The cost for 1918 represents only the usual repairs necessaryin the operation of Skips & Cages. The increase in wages is about the only factor that accounts for the increase.

Undg. Tracks and Cars, Acct. 135,

Year 1918,	$2381.26	Cost per Ton	.008
Year 1917,	3123.30	"	.012
Decrease 1918,	742.04	"	.004

The account again shows a decrease over the preceeding year. The cost representing only the general upkeep of this equipment. No new rail was used during the year.

MAINTENANCE
(CONTINUED)

Electric Tram Plant,				
Acct. 136,	Year 1918,	$10079.82	Cost per Ton	.035
	Year 1917,	8057.18	"	.030
	Increase 1918,	2022.64	"	.005

The increase in this account is due mainly to locomotives. It was almost impossible to get the proper grade of material that would stand the hard wear that this part of the equipment is put to especially armatures and wheels and numerous renewals were necessary. Increase in wages, also, helps to increase this account.

Tel. & Safety Devices,				
Acct. 137,	Year 1918	$974.53	Cost per Ton	.003
	Year 1917	468.17	"	.002
	Increase 1918,	506.36	"	.001

The increase in this account is due to repairs to lighting system in mine, telephones, ladderways, etc.

MINING EXPENSE.

Air Pipes,				
Acct. 150,	Year 1918	$2303.71	Cost per Ton	.008
	Year 1917	1995.81	"	.007
	Increase 1918,	307.90	"	.001

The increase in wages accounts for the increase in this cost over 1917. Only the regular maintenance of branch lines has been necessary during the past year.

Compressors,				
Acct. 151,	Year 1918,	$25595.25	Cost per Ton	.088
	Year 1917,	15458.69	"	.058
	Increase 1918,	10136.56	"	.030

The increase in this account is due to wage increase and increase of 50% in the cost of electric current from .01 per K.W.H. in 1917 to .01½ in 1918.

Hoisting,				
Acct. 152,	Year 1918,	$20798.22	Cost per Ton	.072
	Year 1917,	16829.69	"	.063
	Increase 1918,	3968.53	"	.009

The increase in this account is due to wage increase and increase of 50% in the cost of electric current from .01 per K.W.H. in 1917 to .01½ in 1918.

MINING EXPENSE
(CONTINUED)

Pumping, Acct. 153,	Year 1918,	$21249.00	Cost per Ton	.073
	Year 1917,	16000.42	"	.060
	Increase 1918,	5248.58	"	.013

The increase in this account is due to wage increase and increase of 50% in the cost of electric current from .01 per K.W.H. in 1917 to .01½ in 1918.

Sinking & Shaft Repairs, Acct. 154,	Year 1918,	$21139.06	Cost per Ton	.073
	Year 1917,	15878.85	"	.059
	Increase 1918,	5260.21	"	.014

During this year the 400 ft. lift in the Morris shaft was completed, level cut and storage pocket installed on the bottom level.

Rock Drifting, Acct. 155,	Year 1918,	$5323.08	Cost per Ton	.019
	Year 1917,	7170.68	"	.027
	Decrease 1918,	1847.60	"	.008

Very little development work was done this year due to a shortage of labor. The amount of rock drifting done during the year was only to develop the known ore bodies.

Breaking Ore, Acct. 156,	Year 1918,	$190938.42	Cost per Ton	.66
	Year 1917,	161849.95	"	.604
	Increase 1918,	29088.47	"	.056

The increase in this account is due to the increase in wages and material over 1917. It is still low for 1918 as we mined 58,020 tons from open pit which was low in cost as some of it was mined and cast into mills by steam shovel.

Tramming, Acct. 157,	Year 1918,	$48660.44	Cost per Ton	.169
	Year 1917,	41494.40	"	.155
	Increase 1918,	7166.04	"	.014

Increase in this account is due to wage increases during the year.

Timbering, Acct. 159,	Year 1918,	$76374.01	Cost per Ton	.264
	Year 1917,	67580.91	"	.252
	Increase 1918,	8793.10	"	.012

The increase in this account is due to the increase in wages. There is a decrease in the amount of mine timber used amounting to $3946.88. The ore from open pit, 58,020 tons, was mined without the use of timber which accounts for the cost per ton being so close to the 1917 cost.

MINING EXPENSE
(CONTINUED)

Captain & Bosses,

Acct. 160,				
	Year 1918,	$17938.30	Cost per Ton	.062
	Year 1917,	13550.06	"	.051
	Increase 1918,	4388.24	"	.011

The increase this year is due to wage advances.

Dry House,

Acct. 161,				
	Year 1918,	$8511.48	Cost per Ton	.029
	Year 1917	6019.89	"	.023
	Increase 1918,	2491.59	"	.006

Increase in this account is due to increase in wages and increase in price of coal over year 1917.

Top Landing & Tramming,

Acct. 162,				
	Year 1918,	$7649.80	Cost per Ton	.027
	Year 1917,	5954.74	"	.022
	Increase 1918,	1695.06	"	.005

Increase this year is due entirely to wage advances.

Stocking Ore,

Acct. 163,				
	Year 1918,	$2108.19	Cost per Ton	.007
	Year 1917,	1494.05	"	.005
	Increase 1918,	614.14	"	.002

The increase in wages this year accounts for increase in this account over last year.

Stripping,

Acct. 165,				
	Year 1918,	$14192.53	Cost per Ton	.049
	Year 1917	- - -	"	- -
	Increase 1918,	14192.53	"	.049

During this year we closed off the balance for stripping Section 6 open pit.

Cave In,

Acct. 166,				
	Year 1918,	$105.44	Cost per Ton	.000
	Year 1917,	27.82	"	.000
	Increase 1918,	77.62	"	- -

The increase in this account is due to small cave of sand in working above 2nd level in Lloyd Mine.

MORRIS MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR - 1918.

GRADE	IRON	PHOS.	SILICA
Morris Bessemer,	59.49	.051	7.13
Morris,	58.87	.063	7.29
Morrisville,	51.57	.063	18.78

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR - 1918.

GRADE	Mine IRON	Mine PHOS.	Lake IRON	Erie MOIST.
Morris Bessemer,	All Mixed			
Morris,	"	"		
Morrisville,	53.61	.062	53.40	10.36

ORE STATEMENT - DECEMBER 31ST, 1918.

	MORRIS BESSEMER	MORRIS	MORRISVILLE	TOTAL	TOTAL LAST YEAR
On hand Jan. 1st, 1918,	6,345	3,769	17,610	27,724	57,492
Output for Year,	20,109	20,378	7,761	48,248	62,445
Stockpile Overrun,					2,495
Total,	26,454	24,147	25,371	75,972	122,432
Shipments,	23,785	13,576	14,925	52,286	94,708
Balance on Hand,	2,669	10,571	10,446	23,686	27,724
Decrease in Output - 26%				16,692	
Decrease in Ore on Hand,				4,038	

1918 - 2-8 Hr. Shifts for year

1917 - 2-8 Hr. Shifts for year.

MORRIS MINE.

MORRIS MINE

SHIPMENTS FOR YEAR -- 1918.

GRADE	POCKET	STOCKPILE	TOTAL	TOTAL LAST YEAR	
Morris Bessemer,	8,574	15,211	23,785	59,620	
Morris,	12,271	1,305	13,576	14,050	
Morrisville,	49	14,876	14,925	21,038	
Total,	20,894	31,392	52,286	94,708	
Total last Year,	26,172	68,536	94,708		
Decrease - 44%			42,422		

MORRIS MINE.

LLOYD MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR - 1918.

GRADE	IRON	PHOS.	SILICA
Lloyd Bessemer,	59.68	.050	6.15
Lloyd,	59.02	.084	6.84
Lloyddale,	59.55	.141	5.61
North Lake Silica,	52.17	.068	16.93

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR - 1918.

GRADE	Mine IRON	Mine PHOS.	Lake Erie IRON	Lake Erie MOIST.
Lloyd Bessemer,	All Mixed			
Lloyd,	59.06	.086	59.00	10.54
Lloyddale,	All Mixed			
North Lake Silica,	51.41	.062	53.61	10.33

ORE STATEMENT - DECEMBER 31ST, 1918.

	LLOYD BESSEMER	LLOYD	NORTH LAKE SILICA	LLOYDDALE	TOTAL	TOTAL LAST YEAR
On hand Jan. 1st, 1918,	916	31,006	15,293	23,960	71,175	60,660
Output for Year,	1,763	146,152	33,786	59,551	241,252	202,847
Total,	2,679	177,158	49,079	83,511	312,427	263,507
Shipments,	2,679	155,166	45,322	60,087	263,254	192,332
Balance on Hand,	0	21,992	3,757	23,424	49,173	71,175
Increase in output - 19%					38,405	
Decrease in ore on hand,					22,002	

2-8 Hour Shifts - 1917 & 1918.

LLOYD MINE.

LLOYD MINE

SHIPMENTS FOR YEAR -- 1918.

GRADE	POCKET	STOCKPILE	TOTAL	TOTAL LAST YEAR	
Lloyd Bessemer,	2,545	134	2,679	26,108	
Lloyd,	115,562	39,604	155,166	117,632	
North Lake Silica,	20,744	24,578	45,322	36,085	
Lloyddale,	38,668	21,419	60,087	12,507	
Total,	177,519	85,735	263,254	192,332	
Total last Year,	131,147	61,185	192,332		
Increase - 37%			70,922		

MORRIS-LLOYD MINE.

COMPARATIVE MINING COST FOR YEAR.

	1 9 1 8.	1 9 1 7.	INCREASE.	DECREASE.
PRODUCT	289,500	284,000	5.500	
General Expense	.106	.096	.010	
Maintenance	.134	.097	.037	
Mining Expense	1.599	1.387	.212	
Cost of Production	1.839	1.580	.259	
Exploratory	.034	.033	.001	
DEPRECIATION.				
Original Purchase	.056	.053	.003	
Plant Account	.251	.239	.012	
Equipment	.001	.003		.002
Uncompleted Construction	.008		.008	
Total Depreciation	.316	.295	.021	
Taxes	.138	.088	.050	
Central Office	.072	.064	.008	
Supply Inventory	.011		.011	
Miscellaneous	.015		.015	
Sundry Expense	.030	.013	.017	
Cost on Stockpile	2.455	2.073	.382	
Loading & Shipping	.083	.106		,023
Total Cost on Cars	2.538	2.086	.452	
No. Days Operating	297	302		5
No.Shifts and Hours	2-8hr	2-8hr		
Avg. Daily Product	975	940	35	
COST OF PRODUCTION.				
Labor	1.247	1.113	.134	
Supplies	.592	.467	.125	
Total	1.839	1.580	.259	

MORRIS-LLOYD MINE.

COMPARATIVE WAGES AND PRODUCT.

	1 9 1 8.	1 9 1 7.	INCREASE.	DECREASE.
PRODUCT	289,500	267,787	5,500	
No.Shifts and Hours	2-8hr	2-8hr		
AVERAGE NUMBER MEN WORKING				
Surface	45	45		
Underground	191	206		15
Total	236	251		15
AVERAGE WAGES PER DAY				
Surface	4.51	3.44	1.07-29.8%	
Underground	5.10	3.90	1.20-30.7%	
Total	4.99	3.81	1.18-30.9%	
WAGES PER MONTH OF 25 DAYS				
Surface	102.75	86.00	16.75	
Underground	127.50	97.50	30.00	
Total	124.75	95.25	29.50	
PRODUCT PER MAN PER DAY				
Surface	20.41	18.47	1.94	
Underground	5.05	4.29	.76	
Total	4.05	3.48	.57	
LABOR COST PER TON				
Surface	.221	.186	.035	
Underground	1.010	.909	.101	
Total	1.231	1.095	.136 - 12%	
AVG. PRODUCT BRK'G & TRM'G	7.77	7.62	.15	
" WAGES CONTRACT MINERS	5.34	4.14	1.20 - 29%	
" " " TRAMMERS	0	0		
" " " LABOR	5.34	4.14	1.20	
TOTAL NUMBER OF DAYS				
Surface	14,184¼	14,497¼		313
Underground	57,289¾	62,400		5,110½
Total	71,473¾	76,897¼		5,423½
AMOUNT FOR LABOR				
Surface	63,968.82	49,957.92	14,110.90	
Underground	292,494.86	243,244.93	49,249.93	
Total	356,463.68	293,102.85	63,360.83	

Proportion Surface to Underground Men:

1918 - 1 to 4.24
1917 - 1 to 4.57
1916 - 1 to 3.93
1915 - 1 to 3.85
1914 - 1 to 4.48
1913 - 1 to 4.05
1912 - 1 to 4.37
1911 - 1 to 4.06

MORRIS-LLOYD MINE.

TIMBER STATEMENT FOR YEAR ENDING DECEMBER 31, 1918.

KIND.	LINEAL FEET.	AVG.PRICE PER FOOT.	AMOUNT 1 9 1 8.	AMOUNT 1 9 1 7.
6" to 8" Timber	157,911	.033	5152.48	3835.09
8" to 10" "	51,713	.05	2593.13	4347.23
10" to 12" "	26,442	.066	1737.33	1275.27
12" to 14" "	4,138	.087	358.48	580.90
Total - 1918	240,204	.041	9841.42	
Total - 1917	299,037	.033		10038.49
	LINEAL FEET.	PER 100'.		
5' Lagging	246,900	.728	1796.32	3407.53
7' "	20,000	.55	110.00	71.42
8' "	588,351	.611	3597.19	4650.82
Total Lagging (1)	855,251	.632	5403.51	8129.77
Poles	45,318	.95	431.49	1455.04
Total - 1918	900,569	.647	5835.00	
Total - 1917	1,666,562	.575		9584.81

Product		289,500	267,787
Feet Timber per ton of Ore		.83	1.12
Feet Lagging " (1)		2.95	5.66
Feet Lagging per foot of Timber		3.56	5.07
Cost per ton for Timber		.034	.038
" Lagging		.019	.03
" Poles		.001	.005
" Ti,ber, Lagging & Poles		.054	.073
Equivalent of stull timber to Board Measure		373,884	450,728
Ft. Bd.Measure per ton of Ore		1.29	1.69
Total cost for Timber, Lagging & Poles	1918		15676.42
"	1917		19623.30
"	1916		20682.74
"	1915		14219.21
"	1914		12335.11
"	1913		8394.16
"	1912		6634,06
"	1911		6001.30

MORRIS-LLOYD MINE.

STATEMENT OF EXPLOSIVES USED FOR BREAKING ORE.

KIND.	QUANTITY.	AVERAGE PRICES.	AMOUNT 1 9 1 8.	AMOUNT 1 9 1 7.
40% Powder(Red Cross)	139,035	.184	25599.15	26934.35
50% "				27.20
60% " " "	1,082	.257	278.59	419.04
60% " Gelatine	3,325	.273	907.63	1552.07
Total Powder	143,442	.187	26785.37	28932.66
Fuse	405,100	.628	2544.81	2989.31
Caps	74,970	13.38	1003.25	1194.55
Cap Crimpers	28	.74	20.67	12.39
Tamping Bags	26,000	2.29	59.52	55.10
Connecting Wire				2.77
Total Fuse,Etc.			3628.25	4254.12
Total Explosives			30413.62	33186.78
Product	289,500			267,787
Pounds Powder per ton Ore	.496			.686
Cost per ton for Powder	.0925			.108
" Fuse,Etc.	.0125			.0159
" All Explosives	.015			.1239
Avg.Price per lb.for Powder	.187			.157

Mr. M. M. Duncan, Vice Pres. & Gen. Mgr.,

Ishpeming, Michigan.

Dear Sir:-

I beg to submit the following report of the work done in the Gwinn District for the year ending December 31st, 1918.

The various subjects have been taken up under the following heads:

GENERAL REMARKS

AUSTIN MINE

STEPHENSON MINE

PRINCETON MINE

GWINN MINE

JOPLING MINE

FRANCIS MINE

MACKINAW AND GARDNER MINES

GENERAL SURFACE

ANALYSIS OF COST SHEETS.

ANALYSIS OF NEW CONSTRUCTION.

GENERAL REMARKS.

The product of the several producing mines for the year was as follows:

Gwinn Mine	155,534 tons	
Princeton Mine	148,265 "	
Francis Mine	41,535 "	
Mackinaw Mine	2,312 "	
Gardner Mine	42 "	
Total Product for the Year		347,688 tons
" " " 1917		469,158 "
Decrease, 1918		121,470 "

The Gwinn and Princeton Mines supplied 87% of the ore mined in the Gwinn District in 1918. The product from the Francis Mine was small, as this mine did not go on an operating basis until May 1st, 1918, and during the balance of the year it was being developed for ore production. Development work was continued at both the Mackinaw and Gardner Mines and a small product obtained from development work. Development work was also continued throughout the year at the Jopling Mine but no ore has as yet been encountered. Pumping was continued the greater part of the year at the Stephenson and Austin Mines, the water being lowered approximately 36 feet after pumping was started.

There has been a shortage of labor throughout the year, which has greatly curtailed development work at some of the mines. There has always been sufficient labor for both underground and surface work at the Princeton Mine owing to the fact that there was no work at either the Austin or Stephenson Mines. The shortage has affected the development of the Francis and Mackinaw-Gardner Mines more than any of the other properties. At the first of the year there were 714 men employed in the district and at the close of the year there were 618.

The building operations of the Company during 1918 were confined to erection of 10 double houses and three cottages at the Gardner-Mackinaw Location, which work is now about 35% completed. Two houses were built the last of the year in Gwinn on Elm Street on lots which had been sold.

On Sept. 5th there were 438 men registered for the selective

draft in Forsyth Township. It is interesting to note that of these, 247 were citizens, 76 had first papers and 115 were non-declarant aliens. There were 363 registered in 1917, making the total for the two registrations 801 for Forsyth Township. Over 95% of the registrants were employed by The Cleveland-Cliffs Iron Company. Up to Jan. 1st, 1918, a total of 41 men had volunteered and been drafted into the Army and Navy. In 1918, 41 additional men entered the Army and Navy and colleges for special instructions, making a total of 82 men who left this district to take part in the war.

The past year has been a unsatisfactory one from the standpoint of cost of ore produced. There were three wage increases and the cost of many supplies has continued to advance; this coupled with the labor shortage and the unusual conditions existing at the producing mines resulted in high operating costs.

There were a few cases of Influenza early in October, but, as the schools were closed, as also all other public gatherings, it was soon under control. The latter part of November one of the employes of the Gwinn Mine went to his home in another part of the county, where the disease had swept through practically all families. He returned and spent Sunday at his boarding house, where there were a number of children, and went to work at the Gwinn Mine on Monday, by which time he was sick. The children contracted the disease, went to school infecting other children, and also a number of men contracted the disease at the Gwinn Mine. In a few days it had reached epidemic proportions and it was necessary to open an emergency hospital. The crest of the epidemic was reached about the 8th of December; during the balance of the month it gradually subsided. There was a total of approximately 500 cases, with 21 deaths. It seriously effected the output of the Gwinn Mine, where the number of men employed underground dropped from 125 to an average of not over 75. It also effected the Francis and Princeton Mines, but to a lesser degree.

GENERAL REMARKS.

AUSTIN MINE.

The Austin Mine was not operated in 1918. The mine was closed down on Dec. 31st, 1917, on account of being flooded with water from the Stephenson Mine.

Shipments from stockpile in 1918 were as follows:

Austin Bessemer	3054 tons
Austin	740 "
Austinport or No. 2	4739 "
Total	8533 "

The following is the estimate of ore in sight at the Austin Mine on Dec. 31st, 1917:

	Austin Bessemer	Austin	Austin No.2	Total
Above 1st Level	14,700	2,000	8,300	25,000
" 2nd "	36,800	5,200	20,900	62,900
" 3rd "	30,000	4,200	17,100	51,300
" 4th "	10,520	1,490	5,990	18,000
" 5th "	4,890	680	2,770	8,340
TOTAL TONS	96,910	13,570	55,060	165,540

The estimate of 1917 is included in this report as the mine did not operate during 1918.

Pumps have been operated in this shaft during the past year and also some work has been done on No. 2 shaft. It had been expected that the water would be lowered sufficiently to permit of operating the three upper levels of the mine during the summer of 1918; this unfortunately was not possible, but there is now hopes that some ore may be obtained from this property in 1919. At the close of the year the water was down to the back of the second level, so that it would require a gain of less than 200 feet to permit of operating this mine.

The following is the record of the work done at this property during 1918.

No. 2 Shaft.

The work of enlarging and retimbering No. 2 shaft from surface down to the first level was started the last of December 1917. A tripod was set up over the old timber raise, or No. 2 shaft as it is now called, and a small

engine house constructed near by to house the hoist. A crew of men under Capt. Bone started this work, at first on two 8-hour shifts and later on three. It was realized that this work would have to be done at some future time and the decision to do it at this time was influenced largely by the fact that employment had to be provided for the men released from the Austin and Stephenson Mines, all of whom it was not possible to employ immediately in the other mines in the district. By the end of January the old timber raise had been enlarged and retimbered to a point nearly 100 feet below surface. This work was completed early in February, the connection being made to that portion of the shaft which had already been enlarged. In 1917 this shaft had been raised from the third to the second level and the work of enlarging the old timber raise from the second level to surface started. At the time the mine was flooded this work had reached a point about seven feet below the first level, to which point a connection was made in February 1918. This completed all underground work which could be done on account of the mine being filled with water.

The timber for the headframe for No. 2 shaft was framed early in the year and the headframe was erected the latter part of the year.

In order to handle the water, which was pumped from this shaft, it was necessary to build a launder about 300 feet in length and to open up the old ditch which conveyed the water from this point to the Escanaba River. A 500 gallon Prescott Sinker Pump, operated by steam, was installed in the shaft early in January. In April a 1000 gallon Electric Centrifugal Pump was also installed, and these two pumps have been operated steadily throughout the balance of the year. Before the electric pump was installed a 200 gallon steam pump was also operated for a short period in conjunction with the 500 gallon steam pump.

In April it was noticed that there had been a settlement of ground near the Austin shaft due to mining operations of 1917. A small cave appeared on surface, 250 feet north of the shaft, and from this cave a crack extended some 300 feet to the south-east. This crack passed about 30 feet back of the shaft, on the footside. There have been no change in conditions here

during the balance of the year, but it is evident that it will not be safe to use the present shaft for future mining operations. There has evidently been a settlement of ground, which has extended back of the shaft, and any further mining operations would probably result in the shaft moving out of line to the west.

From present indications it will be necessary to sink No. 2 shaft to the fifth level and handle the ore remaining in the mine through this shaft.

During the past summer the ore stocked in 1917 has all been shipped. The new stocking trestles, which were erected during the fall of 1917, were partly dismantled to permit of loading out this ore. There were 7464 tons of ore in stock at the time the mine was flooded; shipments in 1918 totaled 8533 tons, the overrun from ore stocked being 1069 tons. This large overrun was due to cleaning up the old stockpile grounds which yielded several hundred tons.

AUSTIN MINE

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR 1918.

GRADE	
Austin Bessemer,	All mixed
Austin,	" "
Austimport,	" "

ORE STATEMENT - DECEMBER 31ST, 1918.

	AUSTIN BESSEMER	AUSTIN	AUSTINPORT	TOTAL	TOTAL LAST YEAR
On hand Jan. 1st, 1918,	3,368	0	4,096	7,464	225
Output for Year,					51,672
Transferred,	740	740			
Stockpile Overrun,	426		643	1,069	
Total,	3,054	740	4,739	8,533	51,884
Shipments,	3,054	740	4,739	8,533	44,420
Balance on Hand,	0	0	0	0	7,464

1918 - Mine idle account water

1917 - Mine idle January 1st to April 23rd
1-8 Hr. Shift April 23rdmto December 31st

SHIPMENTS FOR YEAR - 1918.

	POCKET	STOCKPILE	TOTAL	TOTAL LAST YEAR
Austin Bessemer,	0	3,054	3,054	25,216
Austin,	0	740	740	3,347
Austimport,	0	4,739	4,739	15,857
Total,	0	8,533	8,533	44,420
Total last Year,	44,208	212	44,420	
Decrease - 81%			35,887	

AUSTIN MINE.

COMPARATIVE MINING COST FOR YEAR.

	1 9 1 8.	1 9 1 7.	INCREASE.	DECREASE.
PRODUCT	1,069	51,559		
General Expense		.145		
Maintenance		.148		
Mining Expense		1.228		
Cost of Production		1.521		
DEPRECIATION.				
Plant Account		0		
Total Depreciation				
Taxes		.045		
Central Office		.061		
Miscellaneous		.008		
Idle Expense		.031		
Sundry Expense		.014		
Cost on Stockpile		1.680		
Loading & Shipping		.039		
Total Cost on Cars		1.719		
COST OF PRODUCTION.				
Labor		1.119		
Supplies		.402		
Total		1.521		
No.Days Operating		112		
No.Shifts and Hours		1-8hr		
Avg.Daily Product		257		

Mine closed account of flood.
Production for 1918 as shownmis stockpile overrun.

AUSTIN MINE.

COMPARATIVE WAGES AND PRODUCT.

	1 9 1 8.	1 9 1 7.	INCREASE.	DECREASE.
PRODUCT	1,069	51,659		
No.Shifts and Hours	1-8hr	1-8hr		
AVERAGE NUMBER MEN WORKING				
Surface	3	11		8
Underground	1	35		34
Total	4	46		42
AVERAGE WAGES PER DAY				
Surface	3.92	3.50	.42	
Underground	5.22	4.36	.86	
Total	4.23	4.15	.08-2%	
WAGES PER MONTH OF 25 DAYS				
Surface	98.00	87.50	10.50	
Underground	140.00	102.00	38.00	
Total	105.75	103.75	2.00	
PRODUCT PER MAN PER DAY				
Surface	-	14.86		
Underground	-	4.99		
Total	-	3.74		
LABOR COST PER TON				
Surface	-	.235		
Underground	-	.873		
Total	-	1.108		
AVG.PRODUCT BRK'G & TRM'G	-	7.54		
" WAGES CONTRACT MINERS	-	4.41		
" " " TRAMMERS	-	4.61		
" " " LABOR	-	4.45		
TOTAL NUMBER OF DAYS				
Surface	1,010¾	3,466¼		2,455½
Underground	321	10,344		10,023
Total	1,331¾	13,810¼		12,478½
AMOUNT FOR LABOR				
Surface	3,956.42	12,160.53		8,204.11
Underground	1,674.68	45,089.69		43,415.01
Total	5,631.10	57,250.22		51,619.12

Proportion surface to Underground Men:
1918 - 1 to 3.2

Not producing in 1918 on account of flood.
Production as shown is stockpile overrun.

STEPHENSON MINE.

The Stephenson Mine was closed on Dec. 5th, 1917, on account of flooding. Pumping was continued in an effort to prevent the mine from filling until Dec. 17, by which time the water had reached the first level. Two bailers and a blower were continued in operation for the balance of the month. On Dec. 31st, 1917, the water was 139'4" below the collar; by the end of January it had reached a point 126' below the collar, the rise for the month being 13'4". The following table gives the depth of the water below the collar of the shaft and the loss and gain for each month of the past year.

WATER DATA FOR THE YEAR 1918.

Date	Depth Below Collar Stephenson Shaft	Loss	Gain
Jan. 31st	126'	13'4"	
Feb. 28th	124'	2'	
March 31st	125'		1'
April 30th	125'		0
May 31st	125'		0
June 30th	128'6"		3'6"
July 31st	129'½"		6½"
Aug. 31st	129'2"		1½"
Sept. 30th	146'7"		17'5"
Oct. 31st	148'10"		2'3"
Nov. 30th	148'7"	3"	
Dec. 31st	160'3½"		11'7½"
	ACTUAL GAIN FOR THE YEAR		36'3½"

This shows in a graphic manner the results of increasing the pumping capacity and the periods where the water was held stationary by steady pumping at the same capacity. On Jan. 15th a 500 gallon Prescott Sinker Pump went into operation in the Austin shaft. During the balance of the month of January there were two bailers and the blower operating in the Stephenson shaft, and the 500 gallon pump, referred to above, in the Austin shaft. It was found that it was not possible to hold the water with the pumping equipment operating in January and a small pump of 200 gallon capacity was installed in the Austin; also a 500 gallon Prescott Sinker Pump in the Stephenson shaft. These two pumps in conjunction with the bailers and blower held the water practically stationary during February. After the

500 gallon steam pump went into commisiion at the Stephenson on the 11th of February, one of the bailers had to be abandoned due to an accident in the skip road, so that in the latter part of February it was possible to hold the water stationary with the use of one bailer, the blower, 500 gallon pump in the Stephenson and the 500 and 200 gallon pumps in the Austin. This gave a pumping capacity of approximately 2200 gallons per minute during February. The latter part of the month a new 1000 gallon electric pump was received, which it was planned to install in the Austin shaft.

During March the water was held stationary by operating the 500 gallon Prescott pumps in the Stephenson and Austin shafts together with the blower and one bailer at the Stephenson. It was necessary to make extensive alterations on the 1000 gallon electric pump so that it was not possible to get it into operation during March.

In April the water was also held stationary by operating the same pumping equipment as in March. The 1000 gallon electric pump, which was received in February, went into commission the last week of April, but up to the end of the month it was not operated steadily.

During May the water continued to be held stationary in the shaft. During this month the blower was operated steadily, also the 500 gallon Prescott Sinker Pump in the Stephenson shaft, while in the Austin shaft the 1000 gallon electrically driven centrifugal pump was operated the greater part of the month. The last of the month, however, this 1000 gallon pump went out of commission due to breaking of one of the bearings and it was necessary to start up the steam pump again in the Austin shaft; the water being held stationary by operating the two 500 gallon steam pumps, the bailer and blower at the Stephenson.

The water was held stationary until shortly after the middle of June. By this time the 1000 gallon electric pump had been repaired and was again in operation in the Austin shaft. Bailing was stopped when this pump went into commission, after which the 1000 gallon electric pump, the two 500 gallon steam pumps and the blower were operated. The water was lowered $3\frac{1}{2}$ feet, this being practically the first gain that had been made since the

mine was flooded. The latter part of the month the 2500 gallon electric Layne & Bowler pump was received and the work of installation was started immediately.

In July the water was actually lowered only 6½ inches, although at one time during the month it was lowered 8 feet. The installation of the Layne & Bowler pump was completed on July 23rd. The pump was operated intermittently from July 23rd to July 26th, at which time it was necessary to temporarily stop pumping on account of trouble with the belt driving the pump. The results of the operation of this pump seemed, on first sight, to be extremely favorable, indicating that it would be possible to lower the water down to the second level of the Stephenson, where it was planned to install two steam pump of large capacity.

In August the water was lowered 1½ inches for the month. It was not possible to operate the Layne & Bowler pump steadily due to trouble with the driving belt, which finally was completely wrecked, stopping all further operation of this pump until a new belt had been obtained. Larger pulleys were also ordered and the new belt and pulleys were received the last of the month.

In September the water was lowered 17 feet 5 inches due to operating the Layne & Bowler pump. This pump went into commission on the 6th of September but, owing to the fact that a larger pulley had been placed on the motor, which reduced the speed of the belt, its actual pumping capacity was reduced 1000 gallons per minute. The pump was operated steadily for the balance of the month, its capacity being figured at 2800 gallons per minute, as compared with the capacity of 3800 gallons during the short period that it was operated in July. The combined pumping capacity during the greater part of the month was estimated to be 4800 gallons per minute.

In October the water was lowered 2 feet 3 inches, the pumping capacity during the month being estimated at 4800 gallons per minute. It was evident that no further gain could be expected unless the pumping capacity was increased, and it was decided to install a 500 gallon electric pump on a cage in the Stephenson shaft.

STEPHENSON MINE.

Pumping was continued throughout November, the capacity continuing to be the same as in the previous month, or 4800 gallons per minute. There was an actual loss of 3 inches during the month. The Layne & Bowler pump, however, did not operate as efficiently in November as in October, due to slippage of the driving belt. It is probable that the actual total pumping did not exceed 4600 gallons per minute during the latter part of the month.

A 500 gallon electric pump was installed on a cage in the Stephenson shaft and went into operation early in December. At the same time a new driving belt was installed on the Layne & Bowler pump. The water was steadily lowered throughout the balance of the month, there being a gain of 11 feet 7½ inches. The pumping capacity during this period was estimated at 5300 gallons per minute, this being more than two and a half times the amount of water pumped during the last year that the mine was operated.

Measurements taken at different times during the year in a number of standpipe holes, at distances of a few hundred feet to a mile from the mine, showed a gradual lowering of the water level in all the pipes. This lowering was greatest at a point near the mine and least at the most distant standpipe. At the nearest standpipe this amounted to 12 feet, in the most distant standpipe, which was near the river, it was 2 feet 3 inches. This proved conclusively that the pumping during 1918 had lowered the water level a long distance from the mine and that the quicksand was gradually being drained.

In order to gain more accurate information of the area of the deep basin lying south-west of the shaft it was decided, early in the year, to put down a series of standpipes to locate the ledge. This work will be given in detail in another part of this report. As a result it has been possible to accurately contour the ledge throughout the area that the water is coming from. These standpipe holes proved that the ledge came nearly to surface forming a large basin south of the mine and also defined the limits of this basin. It showed, however, that there was a deep channel between 200 and 300 feet in width extending in a southwesterly direction towards the river on Section 21. It may develop that this deep channel will increase

the amount of water to be handled eventually after the mine is unwatered. This, however, is an unknown factor and cannot be determined until later.

It is now evident that the amount of pumping capacity necessary to unwater the mine was badly under-estimated. Mr. McClure was of the opinion that the Layne & Bowler pump, together with the 1000 gallon electric pump at the Austin, would lower the water to the second level of the Stephenson, where it was planned to install two steam pumps of large capacity. If the Layne & Bowler pump could have been operated at its full capacity of 3800 gallons per minute continuously from the time of its installation on July 23rd, and also the other pumps, it is evident that the water would have been lowered to a point at least 200 feet below the collar by the close of the year. Inability to operate this pump to capacity and frequent delays in its operation resulted in other small pumps being installed which increased the operating expense without increasing the pumping capacity sufficiently to make any material gain. From the knowledge gained of the pumping capacity required for unwatering it was decided to order another Layne & Bowler pump. This pump is of 1200 gallons capacity pumping at a depth of 500 feet below surface. It will be installed in the other skip road at the Stephenson and will have at the start a capacity of at least 3000 gallons per minute. This new pump, in conjunction with the present equipment, will give a pumping capacity for the next 200 feet of approximately 7500 gallons per minute, which, when the gain made by the addition of a 500 gallon pump early in December is considered, seems to prove that this capacity will be sufficient to take the water down to a point where a more semi-permanent pumping plant can be installed. There is no doubt that the steady pumping is draining the area supplying the water and it is only a question of time until the water is brought under control.

STANDPIPE DATA * MEASUREMENTS OF WATER LEVELS.

Standpipe Hole No.	Elev. Water June 1918	REFERRED TO SEA LEVEL Elev. Water Aug. 1918	Elev. Water Oct. 1918	Elev. Water Dec. 18th 1918
65	1081.60	1080.95	1078.80	1074.90
61	1080.40	1080.00	1078.90	1076.55
60	1081.21	1080.63	1079.33	1077.37
59	1079.77	1079.22	1077.89	1076.87
C	1078.29	1075.54	1071.97	1066.29
B	1079.43	1078.28	1076.43	1074.03
W	1078.62	1077.57	1077.32	1076.32
Elev. Water in Stephenson Shaft Referred to Sea Level	1070.25	1066.25	1048.25	1038.25
Depth Below Collar	125 ft.	129 ft.	147 ft.	157 ft.

STANDPIPING ON SECTION 29.

A total of 12 standpipe holes were put down early in 1918 south and east of the Stephenson shaft on Sec. 29 in order to gain accurate information of the size of the deep basin from which the water came that drowned out the mine. The following is a record of the holes;

Drill Holes No.	Location With Respect To Stephenson Shaft	Depth To Ledge	Elevation Of Ledge Above Sea Level	Depth of Ledge Below Collar Of Stephenson Shaft
54	2486 S & 1708 E	84	1066	129
55	3499 S & 1889 E	41	1112	83
56	2925 S & 2714 E	19	1115	80
57	2533 S & 3033 E	60	1064	131
58	2362 S & 3184 E	109	1013	182
59	1713 S & 3721 E	175	959	236
60	2044 S & 3161 E	161	916	279
61	1854 S & 3161 E	181	949	246
62	1614 S & 3761 E	174	961	234
63	3240 S & 300 E	47	1100	95
64	1816 S & 240 W	95	1057	138
65	1605 S & 2424 E	183	958	237
Elevation above sea level of collar of Stephenson Shaft			1195	

The first hole was drilled south of the deep basin near the mine on Sec. 29, and showed the ledge to be higher than was anticipated at this point. The next hole was drilled near the center line of Sec. 29, and about 1000 feet south of Hole No. 54. It showed the ledge to be quite close to the surface and accordingly the next hole, No. 56, was located 1000 feet north-east of No. 55 and 900 feet south-east of No. 54. This hole also

showed the ledge to be close to surface, there only being 19 feet of sand above it. It was decided to continue drilling on this north-east line approaching old hole No. 20. Hole No. 57 showed the ledge to be dropping and No. 58, drilled halfway between No. 57 and old hole No. 20, showed a further drop of 51 feet. Hole No. 59 was located halfway between old hole No. 20 and old hole No. W. It showed the ledge to be quite deep at this point. It was then decided to drill a section across the deep depression in ledge directly north of Hole No. 58, and accordingly Holes Nos. 60, 61 and 62 were drilled on this north and south line. All of these holes showed the ledge to be very deep, the deepest point being at Hole No. 60. Holes Nos. 63 and 64 were drilled on what was presumed to be the top of the ledge south and west of the Stephenson shaft in order to make sure that there was no deep depression leading off to the westward. These two holes showed the ledge to extend close to surface, and, with the other old holes which had already been drilled in this territory, rendered it positive that the rise in the ledge to the west was uniform and continuous. There can be only a limited amount of water entering the basin from this direction as the general thickness of surface here is less than 100 feet. The last hole drilled, No. 65, was located in what was assumed to be the center line of the deep channel extending to the east of the deep depression in the ledge near the Stephenson shaft. This hole proved the continuation of the deep channel from the depression to the eastward. The contours indicate that this channel is from two to three hundred feet in width and it has been proved up for a length of half a mile or within a distance of approximately 700 feet of the Escanaba River. This deep channel undoubtedly will increase the flow of water entering the deep depression in ledge near the mine, into which it is known that the cave extended at the time the mine was flooded in December 1917.

STEPHENSON SURFACE.

Very little surface work has been done during the past year at the Stephenson, as the mine was idle. During the summer shipments from stockpile were as follows;

Shipments 1918		Balance Ore in Stock	
Bessemer	2,650 tons		
Stephenson No. 1	1,459 "		
Stephenson	16,076 "		
Stephenwood	25,211 "	45,907 tons	
North Bessemer	562 "		
Northwestern	1,014 "		
Northdale	28,190 "	4,000 "	(Est.)
Total	75,162 "	49,907 "	

It was decided to overhaul the dry while the mine was idle; also from the fact that it provided work for some of the men who were thrown out of employment when the mine was flooded and who it was impossible to immediately place at the other mines in the district. After the building had been thoroughly cleaned, the walls were given a coat of paint up to a height of six feet, above this point they were whitewashed. All needed repairs were also made at this time.

The addition to the dry, which had been authorized in the fall of 1917, to provide toilets, was completed early in the summer of 1918.

Extensive repairs were made to the office building during the past year. It was noticed that the floors had settled and on examination it was found that the sills, as well as the supports under the sills, had rotted away, making it necessary to install new sills and supports. In order to do this work it was necessary to take the supplies out of the warehouse.

The oil-house built in 1917 had not been quite completed at the end of the year. During the past year steam has been piped to this building and heaters installed. The steel tanks were also placed in the building and has since been used for storage of oil.

Considerable work was necessary at the time of the installation of the Layne & Bowler pump. Side boards were put on the launder a distance

of over half a mile in order to make the launder large enough to carry the water from the Layne & Bowler pump. Ground was excavated at the shaft in order that this pump might be set up about six feet below surface. This was done in order that the suction might be extended six feet further below the 2nd level, in order to give more leeway when the pumping plant was being installed on the 2nd level.

In order to avoid loss due to rotting of the timber in stock at the Stephenson Mine this timber has been framed and teamed to the Princeton Mine. There is still considerable stock of some kinds of timber here but it is being used at the Princeton Mine as rapidly as possible.

During the past year a great amount of trestle timber and legs have been sent from the Stephenson Mine to be used at the other mines in the district. This was done largely on account of the difficulty in obtaining this material during the past year. It, however, has permitted more use to be made of this timber, some of which would otherwise have been in too poor condition for future use at the Stephenson Mine if it had lain in piles for another year.

STEPHENSON MINE.

ORE STATEMENT - DECEMBER 31ST, 1918.

	STEPHENSON BESSEMER	STEPHEN-SON.	STEPHEN-SON No.1	STEPHEN-WOOD.	TOTAL	TOTAL LAST YEAR
On hand Jan. 1st, 1918,	4,000	13,000	0	71,118	88,118	335,033
Output for Year,						201,791
Transferred	1,459		1,459			
Stockpile Overrun,	109	3,076			3,185	13,435
Total,	2,650	16,076	1,459	71,118	91,303	550,259
Shipments,	2,650	16,076	1,459	25,211	45,396	462,141
Balance on hand,	0	0	0	45,907	45.907	88,118
Decrease in ore on hand,				42,211		

1918m- Mine idle account water

1917 - 1-8 Hr. Shift January 1st to December 5th
Idle December 5th to 31st account water

SHIPMENTS FOR YEAR - 1918.

GRADE	POCKET	STOCKPILE	TOTAL	TOTAL LAST YEAR
Stephenson Bessemer,	0	2,650	2,650	39,656
Stephenson,	0	16,076	16,076	122,066
Stephenson No. 1,	0	1,459	1,459	17,006
Stephenwood,	0	25,211	25,211	283,413
Total,	0	45,396	45,396	462,141
Total last Year,	99,077	363,064	462,141	
Decrease - 90%			416,745	

45396
9766
7516

STEPHENSON MINE.

COMPARATIVE MINING COST FOR YEAR.

	1 9 1 8.	1 9 1 7.	INCREASE.	DECREASE.
PRODUCT	4,245	253,266		
General Expense		.154		
Maintenance		.134		
Mining Expense		1.148		
Cost of Production		1.436		
DEPRECIATION.				
Original Purchase		.001		
Plant Account		.008		
Equipment		.005		
Uncompleted Construction		.008		
Total Depreciation		.022		
Taxes		.098		
Central Office		.060		
Supply Inventory				
Miscellaneous		.052		
Sundry Expense		.008		
Cost on Stockpile		1.676		
Loading & Shipping		.129		
Total Cost on Cars		1.805		
No.Days Operating		282		
No.Shifts and Hours		1-8hr		
Avg.Daily Product		898		
COST OF PRODUCTION.				
Labor		.919		
Supplies		.517		
Total		1.436		

Mine did not produce in 1918 on account of being flooded.
Product for 1918 as shown is stockpile overrun.

STEPHENSON MINE.

COMPARATIVE WAGES AND PRODUCT.

	1918.	1917.	INCREASE.	DECREASE.
PRODUCT	4,245	253,266		
No.Hours and Shifts	-	1-8hr		
AVERAGE NUMBER MEN WORKING				
Surface	24	50		26
Underground	10	144		134
Total	34	194		160
AVERAGE WAGES PER DAY				
Surface	4.20	3.31	.89-27%	
Underground	5.23	3.95	1.28-32%	
Total	4.52	3.78	.74-19.7%	
WAGES PER MONTH OF 25 DAYS				
Surface	105.00	82.75	22.25	
Underground	130.75	98.75	32.00	
Total	113.00	94.50	18.50	
PRODUCT PER MAN PER DAY				
Surface	-	15.96		
Underground	-	5.73		
Total	-	4.22		
LABOR COST PER TON				
Surface	-	.207		
Underground	-	.688		
Total	-	.895		
AVG. PRODUCT BRK'G & TRM'G	-	10.84		
" WAGES CONTRACT MINERS	-	4.19		
" " " TRAMMERS	-	0		
" " " LABOR	-	4.19		
TOTAL NUMBER OF DAYS				
Surface	7,473½	15,860		8,386½
Underground	3,365	44,144		40,779
Total	10,838½	60,004		49,165½
AMOUNT FOR LABOR				
Surface	31,387.99	52,428.11		21,040.12
Underground	17,822.01	174,324.65		156,502.64
Total	49,210.00	226,752.76		77,502.64

Proportion Surface to Underground Men:
1917 - 1 to 2.9
1916 - 1 to 3.07
1915 - 1 to 2.73
1914 - 1 to 2.88
1913 - 1 to 3.13
1912 - 1 to 4.69

No Mining done during 1918 on account of mine being flooded.

C. & N. W. SECTION 29 MINE.

ORE STATEMENT - DECEMBER 31ST, 1918.

	NORTH BESSEMER	NORTH WESTERN	NORTHDALE	TOTAL	TOTAL LAST YEAR
On hand Jan. 1st, 1918,	1,394	0	27,312	28,706	25,237
Output for Year,					35,632
Transferred,	1,014	1,014			
Stockpile Overrun,	182		878	1,060	2,408
Total,	562	1,014	28,190	29,766	63,277
Shipments,	562	1,014	28,190	29,766	34,571
Balance on Hand,	0	0	0	0	28,706
Decrease in ore on hand,				28,706	

1918 - Mine idle account water

1917 - 1-8 Hr. Shift to Dec. 5th - Mine flooded.

SHIPMENTS FOR YEAR - 1918.

GRADE	POCKET	STOCKPILE	TOTAL	TOTAL LAST YEAR
North Bessemer,	0	562	562	20,343
Northwestern,	0	1,014	1,014	2,846
Northdale,	0	28,190	28,190	11,382
Total,	0	29,766	29,766	34,571
Totallast Year,	12,079	22,492	34,571	
Decrease - 14%			4,805	

C. & N.W. SECTION 29 MINE.

PRINCETON MINE.

The Princeton Mine was operated on two 8-hour shifts during the year 1918. The product for the year was as follows:

Princeport	27,940 tons
Cambridge	115,263 "
Sec. 19 Cambridge	5,062 "
Total	148,265 "
Rock	34,898 "
Total Ore and Rock	183,163 "

The product for 1918 was larger than was anticipated at the time the mine re-opened. There has been an extraordinary amount of development work completed and this property is now in condition to produce the maximum output possible with the present hoisting equipment for a number of years. Due to the extraordinary amount of development work, and to the repairs and additions to equipment on surface, the cost of the product has been very high. Operating conditions underground showed a slight improvement in the month of December, but the full benefit of the work done in 1918 will not show up for at least another month.

The shipments for 1918 and balance of ore in stock are as follows:

	Shipments for 1918	Balance Ore in Stock
Sec. 19 Cambridge	0	5,062 tons
Princeport	23,266 tons	4,674 "
Cambridge	42,978 "	75,742 "
Total	66,244 "	85,478 "

There are now over 75,000 tons of Cambridge ore in stock, and, with a hoist of 10,000 tons per month, this will be increased to 115,000 tons by the opening of the shipping season. It is very necessary to continue to operate on double shift in order to provide work for the men who will later go to the Austin and Stephenson Mines. Shipments of Cambridge ore from pockets should be started early in May, otherwise all the available stocking grounds will be filled to capacity before the working force can be reduced by transferring men to the Austin.

The ore in sight at the Princeton Mine on Dec. 31st is as follows:

	PRINCEPORT	CAMBRIDGE	TOTAL
Sec. 20 - Ore Above 2nd Level - No. 2 Shaft	2,550		2,550
" " " 4th " "		86,800	86,800
" " " 5th " "	20,000	220,730	240,730
" " " 6th " "	39,250	312,690	351,940
Sec. 18 " " 6th " No. 1 Shaft	22,400	44,740	67,140
" " " 7th " "	5,800	11,650	17,450
TOTAL DEVELOPED ORE	90,000	676,610	766,610
Prospective Ore Above 6th Level-No. 2 Shaft	10,000	163,880	173,880
GRAND TOTAL DEVELOPED AND PROSPECTIVE ORE	100,000	840,490	940,490

The above estimate does not include the ore on C. & N. W. Lease, Sec. 19. There is undoubtedly more ore on the Princeton property, as the estimate does not include any ore below the 6th level. It includes, however, 173,880 tons of prospective ore between the 5th and 6th levels in the territory near No. 3 shaft, where the ore has not yet been developed by drifting on the 6th level.

It had been hoped that the work done in 1918 in the ore between No. 2 and No. 1 shafts would prove that all of the ore in this area was of Princeport grade. Some small areas have yielded 100% Princeport ore, but in other areas only 50% has been of this grade. The estimate shows approximately 10% of the ore in the mine to be of Princeport grade, the greater part of this ore is in the territory between No. 2 and No. shafts and in No. 1 shaft pillar.

The ore produced during 1918 came from the fifth and sixth levels and from the subs above these two levels. The rock work was confined to the fifth, sixth and seventh levels.

The work in detail for the year was as follows:

SUBS ABOVE THE FIFTH LEVEL.

240 Ft. Sub, 35 feet Above the 5th Level.

As soon as new haulage drifts had been driven on the 5th level in the territory near No. 3 shaft and raises put up, mining was started on this old sub-level, 35 feet above the fifth. Mining was in progress here when the Princeton Mine closed down in 1913, but the old drifts on the sub-level had crushed, as had also the old raises, so that the conditions were practically as though this territory had never been opened. In February

three gangs were drifting on this sub-level. In March a number of additional raises were completed and nine gangs worked here. During the greater part of the month, however, the majority of these gangs were merely reopening the old sub-level drifts and engaged in putting up raises from the fifth level to replace the old raises which had crushed. In April all of these gangs were breaking ore and there was consequently an increase in the output. In May and June there were eight contracts mining ore on this sub-level. In July mining had been completed on part of this sub-level and some of the gangs dropped down to open a new sub-level, so that at the end of the month there were only six gangs mining ore here. In August mining operations had been completed to such an extent that there were only two contracts working here. During this month one of the rock raises from the sixth level holed to this sub-level and from this time on the product from the territory adjacent to this raise was handled on the sixth level. In September and October there was only one contract working on this sub-level and in the early part of November mining was completed on this sub-level. All the product from this sub-level was plastic ore of Cambridge grade.

260 Ft. Sub, 19 Feet Above the 5th Level.

This sub-level was opened in July, during which month two contracts who had been working on the 240' Sub, dropped down to open this new sub-level. More gangs started working here during the succeeding months of the year, as work was completed on the sub above, and in December there were six contracts mining ore on this sub-level. By this time sufficient raises had been completed to permit this number of gangs to send their dirt directly to the sixth level. As more raises from the 6th level are completed additional gangs will start mining on this sub-level. All the ore from this sub-level has been plastic and of Cambridge grade.

FIFTH LEVEL.

When the mine was re-opened in December 1917, the old ore haulage drifts, as well as a number of the raises at the south-east end of the mine near No. 3 shaft, were found to be badly crushed. It was decided to drive new drifts through the ore pillar in this territory rather than attempt to

repair the old drifts. During January and part of February several new haulage drifts were driven here, the work being done on three 8-hour shifts. This opened up the level so that raises could be put up to the old sub, where mining was in progress at the time the mine closed down in 1913. At this time there was a total of 365 feet of drifting done here in re-opening this territory for mining operations. Repair work on other old drifts was continued through January and February, and it was necessary to re-timber a total of over 500 feet of old ore drifts through this territory; also many of the old raises had completely crushed and it was necessary to put up new raises. One gang started mining ore on the sill floor of the fifth level in February, working under the hanging at the south-east end of the level. In March the general work of getting the fifth level in condition for handling ore here was completed. It developed about this time that the new drifts that were driven here would not stand without constant repairs. In addition to the crushing of the timber, the ground also heaved upward from the bottom, throwing the haulage tracks out of line so that constant repair work was necessary. During the balance of the year there were from two to five gangs working on the 5th level. Some ore has been mined at two places, one under the hanging at the extreme south-east end of the level, where an area 80' x 25' was mined, the other, an area 60' x 100' in size, midway between No. 2 and No. 3 shafts, where the ore had already been mined down to the back of the 5th level. The rock work for the year was confined to the territory near No. 3 shaft, where a total of 850 feet of rock drifts were driven. A drift was driven back in the footwall here to make a permanent timber and traveling road to No. 3 shaft. A drift was also driven in the footwall to the south-west of No. 3 shaft to provide a way for getting timber and supplies into this territory. Crosscuts were driven from these timber footwall drifts out to the ore body and to the raises that had been put up from the 6th level. Electric haulage was abandoned on the 5th level in November after six raises from the 6th level had been completed, but there was no appreciable drop in the cost of operating the electric tram equipment as all the equipment had to be immediately removed

from the 5th level. The ore haulage drifts were badly crushed and unless they were constantly repaired would soon entirely close up. On completing this work in December, 12 chutemen and tracks cleaners were laid off. There was a total of 989 feet of rock drifting on this level in 1918. One gang continued to work on the 5th level through December repairing the old drifts so that timber could be gotten in to the gangs working on the 260 ft. sub-level. It will be necessary to do repair work here at intervals, as the ground is heavy and it is impossible to hold up drifts in the areas where mining is in progress. During the greater part of the year several gangs of timbermen worked on all Sundays and holidays repairing the ore haulage drifts in the vicinity of No. 3 shaft, where mining was being done on the sub-level above the 5th level. In order to obtain a product it was necessary to mine ore here and no relief was possible until the 6th level had been opened and raises put up. The expense of this repair work and reduced output of gangs working here, due to the bad condition of old raises and haulage roads, together with the rock work on this level, has been a material factor in increasing the cost of ore produced in 1918.

SUBS ABOVE THE SIXTH LEVEL.

When the mine re-opened, in order to immediately give some of the men work, who had been laid off at the Stephenson and Austin Mines, a number of gangs were put to work on the sub-levels adjacent to No. 2 shaft. Considerable of the territory that they were first assigned to came within the limit of No. 2 shaft pillar, so that for a short time it was only possible to re-open the old drifts through this territory and drive a few new crosscuts.

335 Ft. Sub, 47 Feet Above the 6th Level.

During January one gang was drifting in ore at the extreme northwest part of this old sub-level. One gang worked here also during February mining out the ore between the foot and hanging, the ore being only 12 feet thick. In March there were two gangs drifting and mining old pillars on this sub-level. They worked near the point where this sub-level connected

with the old sixth level drift from No. 1 shaft. The hanging is an extremely hard jasper in this territory and has never caved. In April there were four gangs breaking ore on this sub-level between No. 2 and No. 1 shafts. It was found that a number of the old pillars had broken loose from the hanging and it was decided to take these old pillars out. These old pillars were about entirely Princeport grade and work was done here in order that some Princeport ore may be obtained. The ore body here is the downward continuation of the Stegmiller ore body, previously partly mined on Princeton property from No. 1 shaft. The remaining ore consisted of a number of pillars near the boundary line which had broken loose from the hanging. In May and June there were two gangs working on this sub-level. In July there was no work on this sub-level, due to the installation of the rotary dump on the sixth level, which made it impossible to hoist from the sixth level. In August there was only one contract working here. There was no further work done on this sub-level until in November, when work was started on Sec. 18 about half way between No. 1 and No. 2 shafts. In December two gangs worked here, one mining and one repairing an old drift from No. 1 shaft, which was driven years ago on the same elevation as this sub-level. There are quite a number of pillars to be mined on this sub-level about half way between No. 2 and No. 1 shafts.

<u>350 Ft. Sub, 32 Feet Above the 6th Level</u>.

This was an old sub-level which had been opened from No. 2 shaft and over the greater part of it the ore has been outlined by a drift along the hanging, with crosscuts to the footwall. This was practically the only territory where mining could be started when the mine re-opened, as the haulage drifts below on the sixth level were in good condition. In January there were six contracts working here repairing old drifts and dividing up the large pillars by new crosscuts. In February these six contracts were all mining ore. In March there were only two gangs working here, as four of the gangs had been moved to the territory near No. 3 shaft. In April and May there were three contracts working on this sub-level. One of the gangs, which was working furthest to the noth from No. 2 shaft in this

territory, was mining the upward extension of the Sec. 19 ore body on Sec. 20. In June there were four contracts working here, work being largely confined to the upward extension of Sec. 19 ore body on Princeton property. There was no work on this sub-level in July while the rotary dump was being installed on the sixth level. In August, September and October four gangs continued working here. In November there were five contracts working, three of which were mining ore on Sec. 20, one gang mining ore on C. & N. W. Lease Sec. 19 and one gang drifting in ore on Sec. 18. Most of the ore produced from this sub-level has been of Princeport grade. In December four contracts worked on this sub-level, one gang on C. & N. W. Lease Sec. 19, one on Sec. 18 and two slicing ore on Sec. 20.

362 Ft. Sub, 20 Feet Above the 6th Level.

Work on this sub-level started in September, when one gang started outlining the ore body by drifting from a new raise that had been put up in this territory. In October there were two gangs working here. In November there were three gangs, one mining ore on Sec. 20, one drifting in ore on Sec. 18 and one drifting in ore on C. & N. W. Lease Sec. 19. The work on this sub-level on Sec. 19 is proving very disappointing, as the ore is high in phosphorus and semi-plastic. It has developed that there is an upturn in the formation on Sec. 19 between this sub-level and the 350 Ft. Sub. The ore on Sec. 19, above this upturn, is non-plastic and low in phosphorus, while below the upturn it is semi-plastic and high in phosphorus. In December work was continued on this sub-level on Sections 18, 19 and 20 with four gangs of miners working.

SIXTH LEVEL.

A large amount of work has been done during the past year on the 6th level. It was necessary that this level be opened beneath the ore body near No. 3 shaft in order that raises might be put through to the subs above the 5th level and the product from these subs sent to the 6th. The old haulage roads had been driven in ore on the 5th level and, as the mining operations approached the level, it became virtually impossible to keep these old drifts open. This condition was apparent at the time the mine closed down

in 1913, so that on re-opening, every effort was made to hasten the work on the 6th level in order to do away with the unfavorable tramming conditions on the 5th level. In order that electric haulage could be installed and operated to advantage it was necessary to put a run-around at the shaft. This work was started as soon as the mine re-opened in January, and was completed the latter part of April. There was a total of 510 feet of rock drifting in driving this circular drift near the shaft. In addition to the above, some ground was excavated near the shaft so that a double track could be installed in order to admit of handling the cars to better advantage.

In March it was decided to install a rotary dump for dumping the cars at the shaft. This equipment was received on June 30 and all work on the 6th level was stopped during the first three weeks of July while it was being installed. It has proven entirely successful in operation and could readily handle more dirt than is required to keep the hoist in constant operation, in other words, its capacity is considerable in excess of the capacity of the hoist.

When the mine re-opened, drifting was immediately resumed on the foot and hanging wall drifts which were being driven at the time the mine closed down towards the ore body near No. 3 shaft. Work was continued on the footwall drift until in the month of December, by which time this drift had advanced a total of 630 feet, which carried it beyond a point opposite No. 3 shaft. Four crosscuts were turned off from this drift as it advanced, in which there was a total of 150 feet of drifting. At a point opposite No. 3 shaft a crosscut was turned off which was driven in a distance of 110 feet or to a point approximately 120 feet from the line of No. 3 shaft. A drift was then driven in 20 feet from this crosscut and the last of the year a raise was started. This raise will be put up on an angle of 45 degrees from the 6th to the 5th levels and will be used for handling timber and supplies during the time that will elapse before No. 3 shaft is connected to the 6th level. On completing this timber raise work will be resumed on the crosscut to the shaft and when the line of the shaft is reached it will be raised and a connection made to the present bottom of the shaft on the 5th level.

From the rock drift in the footwall there has been a total of six raises put through to the sub-levels above the 5th level and at the end of the year all these raises were being used for handling dirt. The ore body near No. 3 shaft, however, was so wide at the 5th level that it was impossible to mine it all from one set of raises. A parallel footwall drift was driven 75 feet further back in the footwall, a distance of 300 feet, and two raises started here.

Work was started on the hanging wall drift when the mine re-opened. During the year this drift advanced a distance of 440 feet, following the hanging. Part of this time the drift was in ore but for the greater part of the distance it was driven in hanging wall jasper. As all the ore near No. 3 shaft has not yet been mined out down to the floor of the 5th level it was not considered necessary to try to complete the development work on the 6th level during the past year. At the end of the year there remained about 2000 feet of drifts and crosscuts to be driven in the vicinity of No. 3 shaft in order to complete the development of the ore body here. It is thought, however, that the work has now advanced far enough to permit the balance of the development work to be gradually done.

Mining was started early in the year on a small body of ore under the hanging near old No. 1 diamond drill hole. It developed that there was a pocket in the hanging here, the ore extending up about 22 feet above the level. Mining has been virtually completed here at the close of the year. The area mined was 150 feet in length by 50 feet in width.

Shortly after the mine re-opened it was decided to complete the work of connecting the crosscuts under the hanging in the ore body near No. 2 shaft. The footwall drifts here were used for haulage and, after these old crosscuts were connected under the hanging, it was possible to divert the mine water from the footwall drift into this new hanging drift. This made a great improvement in the haulage road. There was a total of about 280 feet of drifting done here, the greater part of which was in ore.

In order that No. 1 shaft pillar might be mined and the dirt hoisted through No. 2 shaft it was necessary that the old drift connecting

No. 1 and No. 2 shafts be straightened and the grades changed so as to permit of installation of electric haulage. Shortly after the mine re-opened this work was started and had not been quite completed at the end of the year. The bottom of the old drift was stoped up and new timber installed for a distance of 400 feet, in addition to which there was about 75 feet of new drift driven in order to straighten out the old drift. Electric haulage tracks were installed here as the drift advanced, and work has now been completed for a distance of 1300 feet from No. 2 shaft. There is about 450 feet of this drift in the footwall on Sec. 19, and from this drift several raises have been put up in order to mine the ore body on C. & N. W. Lease Sec. 19. Late in the year a drift was started to the north from the old haulage drift to No. 1 shaft, which new drift advanced 150 feet by the end of the year. This drift is being driven in order that raises may be put up to mine the upper part of the Sec. 19 ore body on Sec. 18, also for mining the ore on Sec. 19.

During the greater part of the year there has been eight contracts working on the sixth level. Aside from the mining of the small ore body near old No. 1 diamond drill hole, practically all other work has been in rock.

Late in the year when the stocking trestles had been erected so that ore from C. & N. W. Lease Sec. 19 could be stocked on surface, it was decided to drive a crosscut in order to develop the Sec. 19 ore body on the 6th level. This crosscut was started from the old breast of No. 5 crosscut, which had been stopped on the boundary line between Sections 19 and 20. This drift on Sec. 19 was driven a distance of 190 feet in ore. This long extension was not anticipated and it indicates a much larger ore body at the elevation of the level than had been expected from the surface diamond drilling. The ore from this crosscut was of Cambridge grade, running 60% in iron and about .600 in phosphorus.

During the past year there has been a total of 2455 feet of rock drifting on the 6th level. There has been an average of five gangs on rock work during the entire year on this level, or approximately 20% of the number of gangs working in the mine.

Electric haulage has been used on the 6th level since the last of March. Until the rotary dump was installed, the cars were dumped by hand at the shaft. After electric haulage was abandoned on the 5th level, the 5th level motor was taken down to the 6th level and two motors have since been used on the 6th, one hauling ore from territory near No. 3 shaft, the other from the territory between No. 2 and No. 1 shafts. The new motor cars, which have been in use on the 6th level since the rotary dump was installed, have proven very satisfactory. They are solid body cars with a cylindrical shaped box, and are a decided improvement over the saddle back motor car. As they have no doors, they have not lost ore in traveling from raises to the shaft, and the haulage tracks are clean.

SEVENTH LEVEL.

Work was started on the 7th level in February with the installation of the loading pocket at the shaft. This work was completed in April. It was only possible to work here at first on Sundays and holidays when the mine was idle, as it was necessary for the men to be in the shaft part of the time. In May the haulage drifts were started from the shaft. Two gangs worked here, one driving the circular drift to the north of the shaft and the other to the south. In June one of these gangs started drifting north-east from the shaft to the new 7th level pump room. Two gangs continued working here the balance of the year. The pump room, which is located about 50 feet north-east of the shaft, had been completed and the two haulage drifts from the shaft have been extended a total of 600 feet. In December the work of driving an incline down to the sump level was started, after which ground will be excavated for the sump. During the year there was 710 feet of drifting done in developing the 7th level, of which 93 feet was driven on account of the 7th level pump-house and 617 feet for the opening of the level.

This level is being opened in order to permit of mining the ore on C. & N. W. Lease Sec. 19. There is not a very large tonnage on this lease and it is advisable that mining be continued here and this ore removed as soon as possible. An agreement to suspend royalty payments on C. & N. W.

Lease Sec. 19 was made in 1915, payments to be resumed in 1920. In order that this ore may be mined within the required time, so that the minimum royalty payments shall not exceed the total royalty to be paid on the ore on this property, it was necessary that the 7th level be opened at this time. If this feature had not had to be considered it would not have been necessary to have incurred the expense of opening the 7th level in 1918. Plans for this level for 1919, involve the completion of sump, the installation of pumping plant and the driving of drifts beneath Sec. 19 ore body, from which raises will be put up to mine the ore on this property. According to the record of the diamond drill holes the ore does not extend down to the 7th level, so that all the ore on this property can be mined from the 7th level. While this rock work is in progress it is hoped to be able to have very little rock work under way on the 6th level.

C. & N. W. LEASE - SEC. 19.

It had been planned to start developing the ore on Sec. 19 last summer but, owing to the fact that the railroad siding to the loading pocket was not constructed, it was impossible to do any work on this lease until stocking trestles had been erected in the fall. Work was started just as soon as the ore could be handled on surface, and by the end of the year gangs were working on two sub-levels and on the 6th level. The estimate of ore on Dec. 31st, 1918, is as follows:

	Sec. 19 Princeport	Sec. 19 Cambridge	Total
Ore Above 6th Level	5,000 tons	41,900 tons	46,900 tons
Prospective Ore Below 6th Level	5,000 "	19,500 "	24,500 "
Grand Total Developed and Probable Ore	10,000 "	61,400 "	71,400 "

The original estimates made from surface diamond drill holes showed 108,000 tons of ore on Sec. 19. The ore has not yet been fully outlined on the 6th level, nor has there been any developed below the 6th level, so that the estimate of 46,900 tons of ore developed above the 6th level really represents a considerable increase in the amount of ore expected in this territory. The estimate of 19,500 tons probable ore below the 6th level is

very conservative and doubtless a much larger tonnage will be developed here.

The area of the ore body on the 6th level is fully twice as large as was expected from the old surface diamond drill holes, but the amount of ore ultimately developed depends largely on how far the ore extends below the 6th level before it pinches out. There was not sufficient drilling done to give much information on this question, but it seems reasonable to assume it will extend far enough to give a tonnage in excess of that previously estimated for this property.

The only disappointing feature of the Sec. 19 ore body is its content of phosphorus and its physical character. It is largely a semi-plastic ore, running from .400 to .700 in phosphorus. The upper part of the ore body on the 350 Ft. Sub-level, near the Sec. 18 boundary line, is non-plastic ore of Princeport grade but the hanging rolls upward just below this sub-level and then turns down again on a gentle pitch to the south, the ore below the turn being all semi-plastic and thus far 80% or more of it has run above .300 in phosphorus. One of the deeper drill holes showed four feet of Bessemer ore, so that it is possible there may be an improvement at some point below the 6th level.

As stated elsewhere in this report, it is advisable to proceed to mine all of the ore on Sec. 19 as rapidly as possible on account of the royalty payments.

S U R F A C E.

During the year 1918 there has been a very large amount of overhauling of old equipment and repairs, and also considerable new work has been necessary in order to put this property in good condition. The work of overhauling the surface equipment was started on Dec. 10th, 1917, and was pushed as rapidly as possible with a large crew of men in order to permit of re-opening the mine. All the pulley stands between the engine house and the shaft were rebuilt and the sheaves on the top of the shaft were raised 18 inches to permit of raising the skip dumps, after which the dumps were rebuilt. Stocking trestles were erected on both sides of the shaft in order to permit of stocking Cambridge and Princeport ores. Work was also