THE
CLEVELAND - CLIFFS IRON CO.
MINING DEPARTMENT

ANNUAL REPORT
OF
GENERAL MANAGER
FOR
YEAR ENDING
DECEMBER 31ST. 1917

#1988

ANGELINE MINE:

HOLMES MINE:

NEGAUNEE MINE:

MAAS MINE:

ATHENS MINE:

SOUTH JACKSON AND CRUSHER:

MORRIS-LLOYD MINE:

MORRIS MINE:

LLOYD MINE:

SECTION 6:

MORRIS-LLOYD:

GWINN DISTRICT:

AUSTIN MINE:

STEPHENSON MINE:

C. & N. W. LEASE SECTION 29:

PRINCETON MINE:

GWINN MINE:

FRANCIS MINE:

MACKINAW MINE:

GARDNER MINE

GWINN DISTRICT GENERAL:

REPUBLIC MINE:

REPUBLIC MINE CONT'D:

IMPERIAL MINE:

SPIES MINE:

CROSBY MINE:

MEADOW AND FOWLER MINES:

ENGINEERING DEPARTMENT:

GEOLOGICAL DEPARTMENT:

MECHANICAL DEPARTMENT:

SAFETY DEPARTMENT:

PENSION DEPARTMENT:

January 1, 1918.

Mr. Wm. G. Mather, Pres.,

Cleveland, Ohio.

Dear Sir:-

I beg to submit the following report of the operations of the Mining Department of this Company for the year 1917. The inventories, maps, and statements relating to this report go forward to you under separate cover. The reports on the different mines of the Company were made by the Superintendents in charge, and the reports of the Mechanical, Engineering, Geological, and Safety Departments by the heads of these departments.

In September Mr. S. R. Elliott, General Superintendent, left to enter one of the Reserve Officers' Training Camps. No one was appointed to fill his place, as it was assumed that he would take up his work again at the end of the war. He went through the school at Fort Leavenworth with a brilliant record, and was commissioned a Major of the 28th Engineers. He is now in France.

In addition to Mr. Elliott, Messrs. Stevenson, Hayden, and Nicholson of the Engineering Department are now Officers in the Reserve Corps. Owing to Mr. Stevenson's absence, no report is made this year by the Educational Department.

ANNUAL REPORT

OF THE (1917)

MORO MINE

Shipments.

The Moro Mine remained closed throughout the year. 12,606 tons of Scotch ore were shipped from stock-pile by steam-shovel.

Table I.

Ore in Stock. Jan. 1, 1918.

Scotch	9,737 Tons
Scotch Silica	86,875 Tons
Total	96,612 Tons

New Construction.

The coal-dock was rebuilt in June and July.

Surface.

Nearly all the scrap iron from the yard was cleaned up and sold during the year.

MORO MINE

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR-1917.

GRADE	Mine IRON	Mine PHOS.	Lake Erie IRON	Lake Erie MOIST.
Fine Scotch,	55.65	.128	57.00	.88

ORE STATEMENT AND SHIPMENTS FOR YEAR - 1917.

	SCOTCH	SCOTCH SILICA	TOTAL	TOTAL LAST YEAR
On Hand Jany. 1st, 1917,	22,343	86,875	109,218	123,524
Shipments,	12,606	0	12,606	14,306
Balance on Hand,	9,737	86,875	96,612	109,218
Decrease in Ore on Hand,			12,606	

MORO MINE.

ANNUAL REPORT

OF THE

LAKE MINE (1917)

Production and Shipments.

The Lake Mine worked 302 days in 1917, and produced 477,964 tons of ore, an average of 1,582 tons per day. As the stock-piles were not cleaned up there was no overrun credited to production, as was done in 1916. The mine worked on double shift throughout the year.

20,875 tons of rock were mined, an average of 69 tons per day.

The following tables show the production by grades, levels and months, and the shipments and stock-pile balances.

Table I.

Production by Grades.

Grade	Total for Year		Average per Day	
	1917	1916	1917	1916
	Tons	Tons	Tons	Tons
Lake High Phosphorus	253,375	184,176	839	620
Lake Low Phosphorus	224,589	192,860	743	649
Stock-pile Overrun	———	33,886	———	———
Total Ore	477,964	410,922	1,582	1,383
Rock	20,875	23,215	69	78
Total Ore and Rock	498,839	434,137	1,651	1,461

Table II.

Shipments.

Grade	Pocket Tons	Stock-pile Tons	Total Tons
Lake High Phosphorus	142,185	109,848	252,033
Lake Low Phosphorus	183,658	41,483	225,141
Total	325,843	151,331	477,174

All the low phosphorus ore was crushed.

Neither stock-pile at the mine was cleaned up, and no shipments were made from the stock-pile at Presqu' Isle.

Table III.

Stock-pile Balances - December 31, 1917.

Grade	At Mine Tons	At Presqu' Isle Tons	Total Tons
Lake High Phosphorus	44,386	48,226	92,612
Lake Low Phosphorus	19,540	———	19,540
Total	63,926	48,226	112,152

Table IV.

Division of Product by Levels.

Level	Ore Tons	Rock Tons	Total Tons
1027' Sub-Level	10,993	919	11,912
1010' Sub-Level	64,525	1,231	65,756
Fourth Level	175,413	4,822	180,235
982' Sub-Level	106,586	5,052	111,638
Amount Forward	357,517	12,024	369,541

Table IV. (Continued)

Division of Product by Levels.

Level	Ore Tons	Rock Tons	Total Tons
Amount Brought Forward	357,517	12,024	369,541
960' Sub-Level	98,939	7,014	105,953
945' Sub-Level	21,030	1,420	22,450
930' Sub-Level	478	417	895
Total	477,964	20,875	498,839

Table VI.

Production by Months.

Month	Days	Ore per Day Tons	High Phos. Ore Tons	Low Phos. Ore Tons	Total Ore Tons	Rock Tons	Total Ore and Rock Tons
January	26	1,550	16,840	23,451	40,291	2,510	42,801
February	23	1,594	20,081	16,574	36,655	2,785	39,440
March	27	1,492	15,900	24,377	40,277	1,930	42,207
April	23	1,540	14,920	20,502	35,422	1,245	36,667
May	26	1,611	19,408	22,473	41,881	1,840	43,721
June	25	1,800	24,504	20,491	44,995	1,745	46,740
July	25	1,634	23,161	17,692	40,853	1,490	42,343
August	27	1,558	25,539	16,522	42,061	1,295	43,356
September	24	1,486	21,480	14,177	35,657	1,700	37,357
October	27	1,638	27,131	17,001	44,132	1,535	45,667
November	25	1,652	22,496	18,797	41,293	1,555	42,848
December	24	1,435	21,915	12,532	34,447	1,245	35,692
Total	302	1,582	253,375	224,589	477,964	20,875	498,839

Table VII.

Delays.

Date	Hours	Tons Lost	Cause	Cost
January 12th	6	600	Water in Mine.	$ 33.03
January 27th	3	300	Changing skip-rope which was broken.	28.00
March 6th	4	400	Repairing cage hoist.	46.50
July 31st	2	200	No Current.	
September 4th	8	1,000	Putting new gears on cage-hoist.	230.75
September 21st	1½	100	Skip caught in Dump.	3.47
October 8th	2	200	No Railroad Cars.	
December 14th	2	200	Changing skip-rope.	29.50
December 28th	4	400	Arni Alanen's funeral.	
Total	32½	3,400		$ 371.25

Table VIII.

Estimate of Ore Reserves.

1015' Sub-Level	13,000 Tons
Fourth Level	50,000 "
Total Above Fourth Level	63,000 Tons
982' Sub-Level	110,000 "
960' Sub-Level	237,000 "
Fifth Level	687,000 "
Total Between Fourth and Fifth Levels	1,034,000 Tons
Total Ore	1,097,000 Tons
Less 10% Rock and 10% Loss in Mining	219,000 "
Net Total	878,000 Tons

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

Table VIII. (Continued)

Estimate of Ore Reserves.

Estimate January 1st, 1917.	1,264,000 Tons
Production in 1917.	477,964 "
Balance	786,036 Tons
Estimate January 1st, 1918.	878,000 Tons

Fatal Accident.

About 1:15 P.M. on Monday, December 24th, Arni Alanen, a Finnish trammer, working in South-East on the 960 Foot Sub-Level, was instantly killed by a fall of ground due to a blast on the sub-level above. The accident was caused by disobedience of orders and violation of rules by one of the miners working on the 972 Foot Sub-Level.

Alanen was a single man, 22 years old, and lived with his parents.

The mine was closed for half a shift on December 28th for the funeral.

SURFACE.

New Construction.

E and A. No. 320.

Lake Angeline Drainage Pipe.

The lateral from the mine-water ditch to the 30" wooden pipe laid last year was finished in January, and the mine-water was turned into it early in February.

In April the covering of the big pipe was finished, and the discharge ditch near Washington Street in the Junction Location was deepened.

In July, August and September the old launder was torn down.

E and A. No. 352.

Coal Crusher.

The new coal crusher has been received, and is set up ready to run, but the motor and belt have not been received.

Accident to Equipment.

On the afternoon of January 27th one of the skip-ropes broke, when the skip was being hoisted, and the skip was dropped from a short distance above the fifth level to the bottom of the shaft. The skip did not catch in the shaft, and no damage was done either to the skip or to the shaft, except that the pocket in the bottom of the shaft was broken. There was a delay of three hours, while a new rope was being put on.

Repairs to Equipment.

On September 2d, 3d and 4th the gear and pinion on the cage-hoist were replaced by a new herringbone gear and pinion. The hoist has run very much better since the change. The mine was idle 8 hours on September 4th on account of this work.

Lake Angeline Drainage.

The 600 gallon electric pump in the lake bottom was moved west, and the discharge-pipe lengthened 550 feet. By this change one of the air-driven pumps has been eliminated.

Coal-Dock.

A small fire was discovered in the coal-dock early in November. This year much of the coal received was 3/4 size and will have to be crushed.

Underground.

Development.

Practically all of the development work necessary has been done, and little more drifting and raising will have to be done except in opening up the sub-levels for mining.

The water level in the Lake Superior Hematite Mine has been lowered at intervals until it is now at the 930 foot sub-level. The lowest workings in that mine are at about 915 feet, and will be tapped on the next sub-level.

Stoping.

The same policy has been maintained in stoping as during the last two years, and the east and west ends of the ore-body have been worked down rapidly, leaving a wide pillar in the middle to protect the timber-roads and air-ways. Stoping has been carried down to the 960 foot sub-level, 35 feet below the fourth level, in the east half of the vein and down to the 945 foot sub-level in the west half. Practically all of the low phosphorus ore on the west side has been mined.

The balance of the ventilation pillar left on the 1027 foot sub-level was mined during the first half of the year, and about half of this pillar on the 1010 foot sub-level was mined also. During the first half of the year the ore remaining in the east half of the vein on this sub-level, extending 450 feet east from the ventilation pillar, was mined, and the contracts moved to the fourth level.

On the fourth level nearly all the ore east of the ventilation pillar has been mined during the year, only a few pillars remaining in the middle part of the vein. The south quarter of the ventilation pillar has been mined, and also all the ore west of the ventilation pillar as far as Dike "A". The ore between Dike "A" and the boundary was mined in 1916. There are now 8 contracts working on the fourth level and one on the 1010 foot sub-level.

The west half of the 982 foot sub-level was opened in 1916, and all the ore west of the ventilation pillar was mined in 1917. The east side was opened in 1917, and a good deal of stoping has been done along the foot-wall at the east end of the vein and along the south foot-wall. There are now 16 contracts working on this sub-level.

The 960 foot sub-level was opened to be used as an air-way when the ventilation system was installed. In the west half of the vein all the ore west of Dike "A" and most of the ore between the ventilation pillar and Dike "A" was mined in 1917. Two new timber-roads were driven in the ventilation pillar. In the east half of the vein the main drift was extended to the east end of the vein, and a good deal of drifting and cross-cutting and some stoping has been done near the south foot-wall from a point 350 feet east of the ventilation pillar to the end of the vein. The ore lying on the north foot-wall at the east end of the vein was so flat that it has been mined on a sub-level 12 feet above the 960 foot sub-level. This ore has been nearly all mined out. There are now 12 contracts working on this sub-level.

The 945 foot sub-level was opened in the west part of the vein during the latter part of the year, and there are now 8 contracts drifting and stoping here. This ore is all rather high in phosphorus.

One contract has tapped the water on the west boundary on the 930 foot sub-level. Their work has been in rock.

There has been no work on the fifth level.

LAKE MINE.

COMPARISON OF COST SHEETS.

FOR 1916 and 1917.

During the first ten months of 1916 the Lake Mine worked on single shift, but during November and December 1916 and in all of 1917 it worked on double-shift. In 1916 the tons per man was reduced by the employment of stock-pile loaders and by the employment of men on the pipe-line laid to replace the Lake Angeline launder. This reduction was offset, however, by the stock-pile overrun. In 1917 some extra work was done on the pipe-line, but there was no overrun from stock-pile.

Wages were increased 10% on February 1st, 5% on May 1st and again 10% on December 15th in 1916. In 1917 there was a 10% increase in wages on May 1st and another 10% increase on October 1st.

Production.

Year 1916	410,922 Tons	1,383 Tons per Day
Year 1917	477,964 "	1,582 " " "
Increase	67,042 Tons	199 Tons per Day

Labor.

	1916	1917
Average number of men	284	328
Average rate per day	$ 3.14	$ 3.94

Tons per Man per Day.

	1916	1917
Surface	18.18	20.90
Underground	6.57	6.29
Total	4.82	4.83

Cost of Production.

	1916	1917
Labor	.641	.806
Supplies	.262	.271
Total	.903	1.077

GENERAL EXPENSE.

No. 26 - Insurance.

1916	$ 197.99	$ .001
1917	199.77	.000
Increase	1.78	
Decrease		.001

No. 27 - Engineering.

1916	$ 1377.48	$ .003
1917	1219.68	.003
Decrease	157.80	.000

1916 charges were higher on account of surveys for the pipe line laid across the Lake Angeline basin.

No. 28 - Analysis.

1916	$ 6897.15	$ .017
1917	8165.02	.017
Increase	1267.87	.000

The increase is due to the increase in wages, higher cost of supplies in 1917 and to larger shipments.

No. 30 - Personal Injury Expense.

1916	$ 3931.55	$ .010
1917	5002.02	.010
Increase	1070.47	.000

There was one fatal accident in each year, but in 1917 there was a deferred charge of $1466 on account of the death of Alex Rajala, and in 1916 there was a similar charge of $820, an increase $646. Compensation and medical expense increased $386.58. There were 47 accidents in 1916 and 49 in 1917.

No. 30a - Mine Office.

1916	$ 7566.07	$ .018
1917	10817.11	.023
Increase	3251.04	.005

The increase is due to higher salaries paid and to one more man employed in the office in 1917. The principal item of increase in 1917 was the employment of two policemen.

MAINTENANCE.

No. 125 - Tracks and Yards.

1916	$ 1185.20	$ .003
1917	1374.18	.003
Increase	188.98	.000

The increase is due to higher wages in 1917.

No. 126 - Docks, Trestles and Pockets.

1916	$ 1042.03	$ .003
1917	1558.51	.003
Increase	516.48	.000

The maintenance of the rock-dump cost $895.66 in 1916 and $1100 in 1917. Repairs to railroad pockets cost $330 in 1917.

No. 127 - Buildings.

1916	$ 2919.32	$ .007
1917	3911.07	.008
Increase	991.75	.001

The principal items were as follows:

1916	
Repairing coal-dock	$ 602.37
Repairing coal-tunnel	422.40
Repairing timber-tunnel	295.12
Addition to dry	804.42
Repairs to shop roof	77.06
Office painting, etc.	43.12
1917	
Repairing coal-dock	681.95
Repairing timber-tunnel	244.19
250 ft. fire-hose	312.50
Engine and boiler-house	301.62
Office, warehouse, and shops	215.21
Iron rack and storage-shed	116.09
Balance on addition to dry	1148.74
Other repairs to dry	268.04
Top Tram engine house	192.24
Oil shed, salt shed, timber mens' shanty	89.18
Shaft-house	341.31

No. 128 - Shop Machinery.

1916	$ 111.42	$ .000
1917	72.46	.000
Decrease	38.66	.000

The principal item in 1916 was a new drill, costing $65.

No. 129 - Boiler Plant.

1916	$ 2398.33	$ .006
1917	1374.93	.003
Decrease	1023.40	.003

In 1916 the economizer, boiler-settings, stokers, and grates were thoroughly overhauled. No special repairs were made in 1917, except cleaning the economizer.

No. 130 - Hoisting Machinery.

1916	$ 789.84	$ .002
1917	4349.68	.009
Increase	3559.84	.007

In 1917 the principal items were as follows:

Hoisting-ropes	$ 766.20
New Drum	650.00
New Gear and Pinion	750.00
Overwinding device for cage	500.00

To which labor charges for installation must be added.

No. 131 - Compressors and Power Drills.

1916	$ 670.74	$ .002
1917	714.44	.002
Increase	43.70	.000

No. 132 - Pumping Machinery.

1916	$ 2851.01	$ .007
1917	594.31	.001
Decrease	2256.70	.006

In February 1916 the mine was nearly drowned out, and two new steam-pumps and a new water column were put in. A dam was also built on the fifth level. A new electric pump for surface use was bought and the underground pumps repaired. In 1917 the principal item of expense was the purchase of 550 feet of 6" pipe for one of the surface pumps.

No. 133 - Top Tram Engines and Cars.

1916	$ 1483.51	$ .004
1917	1006.97	.002
Decrease	477.54	.002

In 1916 the top tram engine was overhauled in June, two cars were rebuilt and a new rope was purchased. In 1917 a new rope was bought and one car was rebuilt.

No. 134 - Skip and Skip-Roads.

1916	$ 649.30	$ .001
1917	965.13	.002
Increase	315.83	.001

In 1917 500 feet of guides were put in the shaft. Balance of charges is for repairs to skip and cages.

No. 135 - Underground Tracks and Cars.

1916	$ 916.35	$ .002
1917	1588.62	.003
Increase	672.27	.001

The increase is in amount and cost of rail used. 21 tons of 12 lb. were used in 1917.

No. 136 - Electric Tram Plant.

1916	$ 9781.77	$ .024
1917	9432.79	.020
Decrease	348.98	.004

In 1916 a new locomotive cost $2000 and automatic couplers $585.66. In 1917 main line tracks increased $1258, wiring $372, generator and motor $183, spotting engine $75, and care of locomotives $290.

No. 137 - Telephones and Safety Devices.

1916	$ 1564.06	$ .004
1917	1382.03	.003
Decrease	182.03	.001

The decrease is in work underground.

No. 139 - Lake Angeline Drainage.

1916	$ 14404.47	$ .035
1917	2464.01	.005
Decrease	11940.46	.030

In 1916 the upper dam was repaired and a new pipe-line was laid across the lake bottom to replace the old launder. In 1917 the construction of the new pipe line was completed and the old launder was torn down.

MINING EXPENSE.

No. 150 - Air-Pipes.

1916	$ 1412.70	$ .004
1917	1443.75	.003
Increase	31.05	
Decrease		.001

No. 151 - Compressors.

1916	$ 10480.25	$ .026
1917	16805.92	.035
Increase	6325.67	.009

The increase is due to working both shifts in 1917, more ore mined, higher wages, and most of all to higher cost of coal, which increased 87½% in 1917.

No. 152 - Hoisting.

1916	$ 10699.71	$ .026
1917	17467.01	.037
Increase	6767.30	.011

The increase is due to working the mine on both shifts in 1917, higher wages, more ore hoisted, and more particularly to higher cost of coal.

No. 153 - Pumping.

1916	$ 7851.41	$ .019
1917	6519.25	.014
Decrease	1332.16	.005

The charges in 1916 were higher on account of the flood in February.

No. 155 - Rock Drifting.

1916	$ 21475.13	$ .052
1917	29757.31	.062
Increase	8282.18	.010

In 1916 the rock drifting and raising amounted to 4,310 feet @ $4.98 and in 1917 to 5,944 feet @ $4.99.

No. 156 - Breaking Ore.

1916	$ 144766.49	$ .352
1917	228223.90	.478
Increase	83457.41	.126

Wages were increased December 15, 1916, May 1, 1917 and October 1, 1917, and powder and supplies also increased in cost in 1917. In 1916 the cost per ton was lower on account of 10 months work on single shift and a stock-pile overrun of 33,886 tons.

No. 157 - Tramming.

1916	$ 20534.33	$ .050
1917	35544.39	.074
Increase	15010.06	.024

Wages were increased 10% on December 15, 1916, May 1, 1917, and October 1, 1917. The cost of tramming was also higher in 1917, because all the ore from the east end of the fourth level, the 972 and 982 foot sub-levels, had to be transferred by hand on the 960 foot sub-level to save rock drifting.

No. 158 - Filling.

1916	$ 962.34	$ .002
1917	1292.27	.003
Increase	329.93	.001

There was more rock thrown back and left in the workings in 1917 than in 1916.

No. 159 - Timbering.

1916	$ 63259.84	$ .154
1917	83179.08	.174
Increase	19919.24	.020

The increase is due to higher wages, more timber used, and higher prices for timber in 1917.

No. 160 - Captain and Bosses.

1916	$ 8009.85	$ .020
1917	10906.37	.023
Increase	2896.52	.003

The increase is due to higher wages, and to one more boss for 10 months on account of double-shift.

No. 161 - Dry-House.

1916	$ 3371.53	$ .008
1917	5770.22	.012
Increase	2398.69	.004

The increase is due to higher wages paid, one more dry-man for 10 months, on account of double-shift, and to the higher cost of coal in 1917.

No. 162 - Top Landing and Tramming.

1916	$ 6064.02	$ .015
1917	9202.59	.019
Increase	3138.57	.004

The increase is due to operating the mine 10 months longer on double-shift in 1917 than in 1916, to higher wages, and to higher cost of power.

No. 163 - Stocking Ore.

1916	$ 5015.07	$ .012
1917	6290.91	.013
Increase	1275.84	.001

Wages were higher in 1917, and the stocking trestles cost much more to erect, because the stock-piles were not all shipped.

No. 164 - Sorting Ore.

1916	$ 233.99	$ .001
1917	10.99	.000
Decrease	223.00	.001

In 1917 a regular man for picking rock was not employed, this work being done by the stock-pile men.

No. 166 - Cave-In.

1916	$ 5037.34	$ .012
1917	3701.84	.008
Decrease	1335.50	.004

In 1916 the cost of pumping water from the lake bottom was all charged to this account, and in 1917 it was split between 166 and 167. There was less rain in 1917 than in 1916.

No. 167 - Lake Angeline Drainage.

1916		
1917	$ 1131.66	$ .002
Increase	1131.66	.002

There was no charge to this account in 1916. See account No. 166.

No. 171 - Ventilation.

1916	$ 1019.95	$ .002
1917	1609.05	.003
Increase	589.10	.001

In 1916 the fan was not run on night shift all the time, but it was so run in 1917.

RECAPITULATION.

Account	Year 1916		Year 1917		Increase		Decrease	
	Total	Per Ton	Total	Per Ton	Total	Per Ton	Total	Per Ton
General Expense	19,970.24	.049	25,391.60	.053	5,421.36	.004		
Maintenance	40,767.35	.099	30,789.43	.064			9,977.92	.035
Mining Expense	310,193.95	.755	458,856.51	.960	148,662.56	.205		
Cost of Production	370,931.54	.903	515,037.54	1.077	144,106.00	.174		

LAKE MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR-1917.

GRADE	IRON	PHOS.	SILICA
Lake Ore,	59.42	.164	5.02

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR-1917.

GRADE	IRON	PHOS.	
Lake Ore,	58.72	.193	Six straight cargoes to Lake Erie ports
Lake Ore,	59.26	.113	17 " " " " Michigan for Charcoal Furnaces.
Lake Ore,	60.16	.112	All-rail to Charcoal Furnaces

The balance of this grade was shipped in mixed cargoes.

ORE STATEMENT - DECEMBER 31ST, 1917.

	LAKE ORE AT MINE	LAKE ORE STOCKED AT P.I.	TOTAL	TOTAL LAST YEAR
On hand Jany. 1st, 1917,	63,136	48,226	111,362	163,819
Output for Year,	477,964		477,964	377,036
Stockpile Overrun,				33,886
Total,	541,100	48,226	589,326	574,741
Shipmemts,	477,174	0	477,174	463,379
Balance on Hand,	63,926	48,226	112,152	111,362
Increase in Output-16%			67,042	
Increase in Ore on Hand,			790	

2-8 Hr. Shifts for year 1917
1-8 Hr. Shift Jan. 1st to Oct. 1st, 1916
2-8 Hr. Shifts Oct. 1st to Dec. 31st, 1916

SHIPMENTS FOR YEAR-1917.

GRADE	POCKET	STOCKPILE	P.I.STOCKPILE	TOTAL	TOTAL LAST YEAR
Lake,	325,843	151,331	0	477,174	463,379
Last Year,	247,811	161,567	54,001	463,379	
Increase 3%				13,795	

LAKE MINE.

LAKE MINE.

COMPARATIVE MINING COST FOR YEAR.

	1 9 1 7.	1 9 1 6.	INCREASE.	DECREASE.
PRODUCT	477,964	410,922	67,042	
General Expense	.053	.049	.004	
Maintenance	.064	.099		.035
Mining Expense	.960	.755	2205	
Cost of Production	1.077	.903	.174	
Exploratory		.006		.006
DEPRECIATION.				
Original Purchase	.355	.224	.131	
Plant Account	.002	.006		.004
Total Depreciation	.357	.230	.127	
Taxes	.063	.116		.053
Central Office	.049	.040	.009	
Sundry Expense	.015	.013	.002	
Cost on Stockpile	1.561	1.308	.253	
Loading & Shipping	.049	.042	.007	
Total Cost on Cars	1.610	1.350	.260	
No.Days Operating	302	297	5	
No.Shifts and Hours	2-8hr	1-8hr 2-8hr		
Avg.Daily Product	1584	1339	245	
COST OF PRODUCTION				
Labor	.806	.641	.165	
Supplies	.271	.262	.009	
Total	1.077	.903	.174	

LAKE MINE.

LAKE MINE.

COMPARATIVE WAGES AND PRODUCT.

	1 9 1 7.	1 9 1 6.	INCREASE.	DECREASE.
PRODUCT	477,964	410,922	67,042	
No. Shifts and Hours		222-1-8hr		
" "	2-8hr	74-2-8hr		
AVERAGE NO. MEN WORKING				
Surface	76	75	1	
Underground	252	209	43	
Total	328	284	44	
AVERAGE WAGES PER DAY				
Surface	3.25	2.68	.57-21.2%	
Underground	4.15	3.31	.84-25.4%	
Total	3.94	3.14	.80-22 %	
WAGES PER MO. OF 25 DAYS				
Surface	81.25	67.00	14.25	
Underground	103.75	82.75	21.00	
Total	98.50	78.50	20.00	
PRODUCT PER MAN PER DAY				
Surface	20.90	18.18	2.72	
Underground	6.29	6.57		.28
Total	4.83	4.82	.01	
LABOR COST PER TON				
Surface	1.55	.147	.008	
Underground	6.60	.504	.156	
Total	8.15	.651	.164	
AVG. PRODUCT BRK'G & TRM'G	9.79	10.91		1.12
" WAGES CONTRACT MINERS	4.32	3.41	.91	
" " " LABOR	4.32	3.41	.91	
TOTAL NO. OF DAYS				
Surface	22,872¼	22,602½	269¾	
Underground	76,026¼	62,586¼	13,440	
Total	98,898½	85,188¾	13,709¾	
AMOUNT FOR LABOR				
Surface	74,251.50	60,465.59	13,785.91	
Underground	315,341.54	206,932.56	108,408.98	
Total	389,593.04	267,398.15	122,194.89	

Proportion Surface to Underground Men:

1917 - 1 to 3.32
1916 - 1 to 2.79
1915 - 1 to 3.26
1914 - 1 to 3.42
1913 - 1 to 4.10
1912 - 1 to 3.38
1911 - 1 to 3.17

LAKE MINE.

LAKE MINE.

TIMBER STATEMENT FOR YEAR ENDING DECEMBER 31, 1917.

KIND	LINEAL FEET.	AVG. PRICE PER FOOT.	AMOUNT 1917.	AMOUNT 1916.
4" to 6" Timber	2,754	.0151	41.52	
6" to 8"	76,063	.0218	1657.49	1834.57
8" to 10"	196,896	.0416	8182.89	4896.90
10" to 12"	109,764	.0619	6792.53	8663.28
12" to 14"	35,615	.0845	3008.67	2509.22
Total Timber 1917	421,092	.0467	19683.10	
" " 1916	393,631	.0455		17903.97
	LINEAL FEET.	PER 100'		
5' Lagging	1,443,300	.4994	7207.15	5718.00
9' "	107,635	.55	591.99	398.97
7' "	178,875	.55	983.81	341.00
8' "	31,752	.55	174.64	533.50
Total Lagging(1)	1,761,562	.5085	8957.59	6991.47
Poles	12,490	.90	112.41	155.50
Total 1917	1,774,052	.511	9070.00	
Total 1916	1,463,614	.4883		7146.97

Product	477,964	377,036
Feet timber per ton of ore	.881	1.044
Feet Lagging " (1)	3.686	3.837
Feet Lagging per foot of Timber	4.183	3.655
Cost per ton for Timber	.0412	.0475
" " Lagging	.0188	.0185
" " Poles	.0002	.0004
" " Timber, Lagging & Poles	.0602	.0664
Equivalent of stull timber to Bd.Measure	875,112	741,560
Ft. Bd.Measure per ton of ore	1.83	1.97

Total cost for Timber, Lagging & Poles	1917	28753.10
" "	1916	25050.94
"	1915	21780.39
"	1914	18406.67
"	1913	24128.99
"	1912	21525.33
"	1911	19916.58
"	1910	26717.90
"	1909	21927.42
"	1908	17499.22

LAKE MINE.

STATEMENT OF EXPLOSIVES USED FOR BREAKING ORE.

KIND.	QUANTITY.	AVERAGE PRICES.	AMOUNT 1 9 1 7.	AMOUNT 1 9 1 6.
50% Powder O.D.1½"				105.75
50% " L.F. Standard 1½"	89,600	.1814	16255.46	10115.63
Total Powder	89,600	.1814	16255.46	10221.38
Fuse	266,500	6.313	1682.49	1046.31
Caps	78,400	12.86	1008.22	834.99
Cap Crimpers	14	.24	3.31	2.50
Electric Exploders	50	7.14	3.57	
Connecting Wire	1	.45	.45	3.63
Total Fuse, Etc.			2698.04	1887.43
Total All Explosives			18953.50	12108.81
Product			477,964	377,036
Pounds Powder per ton Ore			.187	.195
Cost per ton for Powder			.0340	.0271
" " Fuse, Caps, Etc.			.0056	.005
" " All Explosives			.0396	.032
Avg. Price per lb. for Powder			.1814	.1391

LAKE MINE.

ANNUAL REPORT

OF THE

CLIFFS SHAFT MINE. (1917)

Production and Shipments.

The Cliffs Shaft Mine worked 301 days in 1917, and produced 367,595 tons of ore, an average of 1,221 tons per day. There was no overrun from stock-piles included in the production for the year. Owing to delays while the hoist was being changed and "A" Shaft was being retimbered and when "B" Shaft trestle broke down 7,000 tons of ore were lost for the year. Nearly all the ore produced was screened, everything over a $2\frac{1}{2}$ inch ring going into the lump grade. 9,236 tons of rock were produced during the year, all of which was dumped underground.

The mine worked underground one shift during the year, hoisting being done on both shifts. The number of contracts was increased from 60 to 63, the average being 61.

After the first two months of the year trammers were very scarce, and the mine was short of men during all the summer months. The quality of the trammers decreased even more than the quantity, so that the production per man per day fell. It became necessary to work more small places than in 1915 and 1916 and this further cut down the efficiency of both trammers and miners. In order to offset the shortage of trammers a small revolving shovel and a gasolene locomotive were purchased and installed on the seventh level in "A" Shaft. Owing to the difficulty of handling the coarse ore the shovel has not loaded as much ore as was expected, but it has helped out in the production materially.

Wages were raised 10% on May 1st and again on October 1st.

Table I.

Production by Grades.

	1916		1917	
Grade	Tons	Per Cent	Tons	Per Cent
Lump	175,753	44.4	249,829	68.0
Crushed	219,567	55.6	117,766	32.0
Total	395,320	100.0	367,595	100.0

Table II.

Comparison of Product for 1916 and 1917.

	1916	1917
Days worked	300	301
Ore, Tons	395,320	367,595
Rock, Tons	13,816	9,236
Total Ore and Rock, Tons	409,136	376,831
Ore per Day, Tons	1,318	1,221
Rock per Day, Tons	46	31
Ore and Rock per Day, Tons	1,364	1,252

Table III.

Distribution of Product by Levels.

	"A" Shaft			"B" Shaft			Both Shafts		
Level	Ore Tons	Rock Tons	Ore and Rock Tons	Ore Tons	Rock Tons	Ore and Rock Tons	Ore Tons	Rock Tons	Ore and Rock Tons
1	3307	190	3497	24629	800	25429	27936	990	28926
2	6249		6249	4777		4777	11026		11026
Amt. Fwd.	9556	190	9746	29406	800	30206	38962	990	38952

Table III. (Continued)

Distribution of Product by Levels.

Level	"A" Shaft Ore Tons	"A" Shaft Rock Tons	"A" Shaft Ore and Rock Tons	"B" Shaft Ore Tons	"B" Shaft Rock Tons	"B" Shaft Ore and Rock Tons	Both Shafts Ore Tons	Both Shafts Rock Tons	Both Shafts Ore and Rock Tons
Amt. Brt. Fwd.	9556	190	9746	29406	800	30206	38962	990	38952
3	9190	410	9600	9557	98	9655	18747	508	19255
4	8822	80	8902				8822	80	8902
5	15807	520	16327	9925	202	10127	25732	722	26454
6	36024	510	36534	27937	880	28817	63961	1390	65351
7	29408	280	29688	26467	520	26987	55875	800	56675
8	22791	1410	24201	12131	196	12327	34922	1606	36528
9	33084	396	33480	4779	504	5283	37863	900	38763
10	16542	104	16646	36024	412	36436	52566	516	53082
11				18012	288	18300	18012	288	18300
12				2206	702	2908	2206	702	2908
13				9559	198	9757	9559	198	9757
15	368	536	904				368	536	904
Total	181592	4436	186028	186003	4800	190803	367595	9236	376831

Table IV.

Production by Months.

Month	Days Worked	Ore per Day Tons	Crushed Ore Tons	Lump Ore Tons	Total Ore Tons	Rock Tons	Total Ore and Rock Tons
January	26	1,313	13,634	20,540	34,174	790	34,964
February	23	1,355	11,557	19,600	31,157	860	32,017
March	27	1,391	13,138	24,424	37,562	758	38,320
April	23	1,294	9,644	20,126	29,770	740	30,510
May	26	1,199	9,912	21,269	31,181	988	32,169
June	25	1,182	8,284	21,251	29,535	742	30,277
July	24	1,193	8,131	20,493	28,624	740	29,364
August	27	1,185	9,152	22,851	32,003	938	32,941
September	24	1,107	7,327	19,253	26,580	652	27,232
October	27	1,044	7,860	20,318	28,178	524	28,702
November	25	1,249	17,412	13,822	31,234	770	32,004
December	24	1,150	8,215	19,382	27,597	734	28,331
Year	301	1,221	124,266	243,329	367,595	9,236	376,831
Transfers			-6,500	+6,500			
Net Total			117,766	249,829	367,595	9,236	376,831

Table V.

Shipments.

	Pocket Tons	Stock-pile Tons	Total Tons
Crushed Ore	47,553	74,404	121,957
Lump Ore	138,501	88,432	226,933
Total	186,054	162,836	348,890

Table VI.

Ore in Stock, January 1, 1918.

Cliffs Shaft Crushed	24,097 Tons
Cliffs Shaft Lump	36,741 "
Total	60,838 Tons

Table VII.

Delays.

Date 1917	Hours	Tons Lost	Cause	Cost
Jan. 4	2	100	Top Tram Car.	$ 10.75
Jan. 15	16	800	"A" Shaft frozen up. Skip was caught in shaft and overturned.	25.00
Jan. 16	5	300	Cutting ice in "A" Shaft.	1.80
Jan. 22	2	300	Caused by skip pulling out irons on the 6th level pocket, "B" Shaft.	11.50
Jan. 26	1	100	Cutting ice in "A" Shaft.	1.20
Feb. 17	1	100	Skip caught in pocket; 6th level, "B" Shaft.	10.70
Feb. 19	1	100	No air for air lifts at shaft pockets.	2.70
Feb. 27	2	200	Broken axle on Top Tram Car.	8.70
May 3	1	100	Hoisting engine.	.90
May 4	1	100	Top Tram motor burned out.	5.85
June 26	1½	150	Caused by hoist burning out.	4.80
June 28	½	75	No railroad cars.	
July 21	4	400	No current.	
July 27	1	138	Electric hoist.	.90
Aug. 31	8	350	Shut down to change hoist.	E & A. 316
Sept. 1	6	600	Changing gears on "B" Shaft drum.	E & A. 316
Sept. 4	3	500	Changing socket on "B" Shaft rope.	4.80
Sept. 5	1½	100	Adding more weight to "B" Shaft counter-weight.	3.50
Oct. 1	2	200	"B" Shaft pocket blocked.	.67
Oct. 6	8	300	Repairing electric hoist.	E & A. 316
Oct. 8	2	200	Repairing electric hoist.	E & A. 316
Oct. 9	5	500	Trolley line broke in "A" Shaft. Repairing "A" Shaft and hoist.	
Oct. 10	2	200	Repairing "A" Shaft and hoist.	
Oct. 11	3	300	Repairing "A" Shaft and hoist.	
Oct. 12	3	300	Repairing "A" Shaft and hoist.	
Oct. 13	3	300	Repairing "A" Shaft and hoist.	1144.50
Oct. 15	2	200	Repairing "A" Shaft and hoist.	
Oct. 16	3	300	Repairing "A" Shaft and hoist.	
Oct. 17	2	200	Repairing "A" Shaft and hoist.	
Oct. 18	2	200	Repairing "A" Shaft and hoist.	
Oct. 19	3	300	Repairing "A" Shaft and hoist.	
Oct. 20	4	400	Repairing "A" Shaft and hoist.	
Amt. Fwd.	101½	8413		$ 1238.27

Table VII. (Continued)

Delays.

Date 1917	Hours	Tons Lost	Cause	Cost
Amt. Brt. Fwd.	101½	8413		$ 1238.27
Dec. 1	1	100	Repairing Crusher.	1.50
Dec. 10	1	100	Repairing Top Tram and Car.	
Dec. 11	4	400	Repairing Top Tram and Car.	
Dec. 12	4	400	Repairing Top Tram and Car.	500.00
Dec. 13	4	400	Repairing Top Tram and Car.	
Dec. 14	4	400	Repairing Top Tram and Car.	
Dec. 28	2	200	Repairing Hoisting Machinery.	7.00
Dec. 29	2	200	Repairing Hoisting Machinery.	
Total	123½	10613		$ 1746.77

Table VIII.

Delays Caused by Lack of Electric Current on Main Line.

Date	Hours	Tons Lost
July 21st	4	400

Table IX.

Ore Mined from C. I. M. Co.'s land during year 18,927 Tons

Table X.

Estimate of Ore Reserves.

	"A" Shaft Tons	"B" Shaft Tons	Total Tons
Pillars	927,000	591,000	1,518,000
Floors	1,771,000	1,002,000	2,773,000
Partly Developed	570,000	14,000	584,000
Total	3,268,000	1,607,000	4,875,000
Less 10% Rock	327,000	161,000	488,000
Net Total	2,941,000	1,446,000	4,387,000
To Support Surface	1,587,000	847,000	2,434,000
Available Ore	1,354,000	599,000	1,953,000
Less 10% Rock and 10% Loss in Mining	271,000	120,000	391,000
Net Available Ore Jan. 1, 1918.	1,083,000	479,000	1,562,000

Net Available Ore Jan. 1, 1917.	1,628,000 Tons
Production 1917	367,595 "
Balance	1,260,405 Tons
Net Available Ore Jan. 1, 1918.	1,562,000 "
Ore Developed 1917	301,595 Tons

Fatal Accident.

At 8:40 A.M. on September 12th, Henry Pitala, a Finnish miner, working in No. 4 contract on the ninth level in "A" shaft, while barring the back in a raising stope, was instantly killed by a fall of ground from the back. Pitala was married and leaves a widow and five children under 16 years of age.

Labor.

Wages were increased 10% on May 1st and again 10% on October 1st. In spite of the increases, however, there was a scarcity of trammers, and especially good trammers, after the middle of March. The use of a steam-shovel underground helped out about 50 tons a day during the second half-year.

Repairs to "A" Shaft.

From October 6th to October 22d, while the hoist was being changed "A" shaft was shut down and hoisting was done on two shifts in "B" shaft. During this time "A" shaft was retimbered near the ledge, and 14 sets of new timber were put in. As most of the work was in quicksand there was much difficulty in getting the timber in safely. Several bad runs of sand caused subsidence on surface, which threw the shaft-house and pocket on surface out of plumb.

Exploration.

Underground Diamond Drilling.

17 holes were drilled underground during the year, 8 of which were in "A" shaft and 9 in "B" shaft, a total of 2,220 feet of drilling.

Five holes were drilled north and south from the west drift on the tenth level in "B" shaft to make sure that no ore had been passed by.

#266, #268 and #270 were drilled north into the hanging-wall at 200 foot intervals and found no ore. #267 and #269 were drilled south into the foot-wall. #267 was blank, but #269 found ore.

Two holes, #271 and #272, were drilled north-west from the west end of the Fault Vein on the ninth level in "B" shaft and found ore in the Main Vein.

Two holes, #281 and #282, were drilled on the seventh level in "B" shaft. #281 was drilled north in the pillar between the Main Vein and the North Deposit, but found no ore. #282 was drilled south from the Main Vein 1,000 feet west of the shaft. It found no new ore.

Two holes, #273 and #274, were drilled in the floor of the east stope on the first level in "A" shaft. Both had ore. Two holes, #276 and #277, were drilled east and south-east from the South Lens on the fourth level in "A" shaft. Both had ore to start with, but went into the hanging-wall. Two holes, #278 and #279, were drilled west and east from a stope in the South Lens on the fifth level in "A" shaft, and both found ore; but #280 on the sixth level in "A" shaft in the same ore-body went into the hanging-wall without finding ore. Hole #275 was drilled north from the tenth level north stope in "A" shaft to explore the North Deposit, but found only one small vein. No drilling was done from August until the end of the year.

New Construction.

E and A. No. 311.

New Electric Pump.

A 600-gal. duplex Prescott plunger-pump, duplicating the one already in use, was installed in the pump-house on the fifteenth level in "A" shaft. The pump-house was enlarged in February and March, the foundation was built and the pump erected in April and May. The pump has been in continuous service since May.

E and A. No. 313.

Toilet in Dry.

The installation of the toilets in the addition to the dry was completed in January, and the toilets were put in service. The painting was not completed till May.

E and A. No. 316.

Repairs to Electric Hoist.

The electric hoist in the engine-house was changed so that the drums are operated independently, and the counterweights were increased so that the motors are under load in both directions. New independent herringbone gears and pinions were installed, the gears keyed to the drum-shaft, and a second 500 H.P. motor purchased, so that each drum has its own motor and control. The new foundation for "B" shaft motor was put in in June, but delivery on electrical equipment was delayed so long that the drum was not changed over until the first of September. "A" shaft drum was changed over between October 6th and 22d.

E and A. No. 318.

New Office, Grounds and Drill-Sharpener Building.

The new office was completed in January, and was occupied on January 25th. The drill-sharpener shop was not completed until April. The drill sharpening equipment was then moved up from the old blacksmith shop, and a carpenter-shop partitioned off in its place. The old ware-house was torn down, and the carpenter-shop sold and removed.

Grading and planting were started in April and completed in July.

E and A. No. 334.

Underground Steam-Shovel.

A special 5/8 cu. yd. revolving steam-shovel was purchased from the American Steel Dredge Company, and was taken down to the seventh level in "A" shaft on April 15th. It was erected and tested out in May, and, after some changes, started loading in June. 1½ yard side-dump gravel cars and a two-ton gasolenelocomotive were purchased to use with this shovel. This underground locomotive is covered by E and A. No. 341. This equipment loads 50 tons a shift with 3 men.

E and A. No. 352.

In order to crush the 3/4 coal purchased during the year a set of rolls, motor and elevator were purchased, and have been partly installed in the boiler-house. Installation was delayed, because the carpenters were requisitioned for building the new boiler-house at the Maas Mine.

Surface.

Crusher Building.

The openings in the revolving screen were reduced to 2½" in diameter in March, increasing the proportion of lump to 70% of run-of-mine.

The bar-grizzly was replaced by a revolving grizzly in the latter part of November. During the installation the entire product was crushed.

Railroad Tracks.

The C. & N.W. Ry. built a cross-over from the crushed ore pocket-track to the lump ore pocket-track in November to facilitate handling gondola cars.

Dry.

A small addition was built on the north side of the dry in February for the storage and distribution of carbide.

The hospital room was painted in March, and new equipment was put in.

Underground.

General Development.

Developments underground were more encouraging than in 1916, especially in "B" shaft. In "A" shaft new ore was opened in the South Lens on the fifth and sixth levels, and the ore already found in the South-East Deposit continued to show up well. Unexpected ore was also found in the North Deposit between the eighth and ninth levels. In the Main Vein ore is being followed east in three places, on a sub-level above the eighth level, on the eighth level and on the ninth level. The breast of the eighth level is 400 feet west and 100 feet lower than the bottom level in the Incline Mine. In "B" shaft some new ore was opened on the 1200 foot sub-level near the south boundary, and unexpected ore is being mined near the old workings on the third level in the North Deposit. New ore has been found on the ninth and tenth levels at the west end of the Main Vein, but the end of the Fault Vein has been reached on all levels. Developments on the eleventh, twelfth and thirteenth levels are very promising. A new body of ore has been opened on the north side of the Main Vein on the eleventh level, the extent of which as far as developed is 150 feet long and 50 feet wide. This work is at the top of the ore. On the south side of the vein ore has also been opened, and it is probable that this is part of the same ore-body. On the twelfth level this same ore is showing up very well on the south side of the vein, and on the fourteenth level one gang has been stoping throughout the year in ore. The ore on this level is now 200 feet long and 120 feet wide at the west end, as far as developed.

The limits of the ore have not been reached, and it is impossible to estimate its size accurately. It seems probable, however, that this is the same ore as has been opened on the eleventh and twelfth levels. If this is correct, the amount of available ore in "B" shaft will be materially increased.

General Mining.

The average number of contracts employed during the year was 61. Of these 34 were in "A" shaft and 27 in "B" shaft. 32 were engaged in mining known ore reserves, 25 were developing new ore, and 4 were in rock. There is a large tonnage of ore broken in the stopes.

Description of Work Done.

"A" Shaft.

On the first level one contract mined floors at the east end of the Main Vein throughout the year. Two other contracts mined floors in the west part of the Main Vein and in the North Deposit for a short time.

On the second level two contracts mined a little ore in the floor of the level in the North Deposit and in the South Lens.

On the third level one contract is raising and mining backs in the South Lens. The limits of the ore in this place seem to have been reached.

On the fourth level one contract has stoped west in a narrow vein of ore in the North Deposit throughout the year. At the east end of the Main Vein another contract has been stoping on a sub-level near the hanging-wall, and has raised in new ore to the third level.

On the fifth level one gang has stoped near the north boundary in the North Deposit throughout the year. Another contract has mined the floors left in the ore-body at the east end of the North Deposit. In the South Lens two contracts have been stoping all the year. The ore is narrow and flat.

On the sixth level two contracts have nearly finished the ore in the back of the North Deposit, and one drifted and raised in rock at the east end of the vein during the first half year and drove some cuts through pillars already blocked out. In the South Lens two contracts have been following two narrow veins running east and west. The amount of ore developed here is small.

On the seventh level there are three contracts mining backs and the floors of the sixth level in the North Deposit. One contract is raising in the Main Vein, and two are mining floors in the South Lens.

On the eighth level in the South Lens one gang is mining in the back, and another has been mining floors nearly all the year. In the South-East Deposit one contract opened and mined a body of ore 140 feet long and 20 feet wide, and are now raising in this ore. In the North Deposit one contract drifted west through jasper and opened some new ore, and another raised from the ninth level south of the eighth level main stope and holed across to it. They are now mining in the back. Further east one contract cross-cut north from the Main Vein and opened a small stope in the North Deposit. Two contracts have been working in the Main Vein, one on a sub-level, where they have followed the ore east throughout the year, and one on the main level. This contract stoped some ore near the hanging-wall near the east end of the level, and drifted east in rock to new ore. This is the point farthest east in the mine. It is 400 feet west of and 100 feet below the end of the workings of the Incline Mine.

On the ninth level one contract has raised to the eighth level in the North Deposit, after mining the back of the north stope for six months. Two contracts have stoped throughout the year in the pillar north of the main drift in the Main Vein, and one gang raised to the eighth level at the east end of the vein. In the South-East Deposit one contract has followed the same ore east throughout the year. This ore is now developed for a length of 470 feet and a width of 25 feet.

On the tenth level two contracts continued stoping in the Main Vein north of the main drift, but reached the limits of the ore, and have been mining in the back during the last few months. In the South-East Deposit two gangs have mined the ore between the ninth and tenth levels throughout the year.

On the fifteenth level one raise has been put up to the tenth level and another has been put up more than half-way.

"B" Shaft.

On the 1200 foot sub-level the same four contracts have worked throughout the year. Two have mined the ore on the foot-wall and under the hanging-wall in the Main Vein, one has opened a new ore-body 150 feet long, 250 feet further south, and the other has mined the floor of the 1220 foot sub-level further east.

On the first level one contract has mined floors at the east end of the Main Vein throughout the year.

On the third level one contract has continued stoping west in the North Deposit south of the old workings. At the end of the year the ore was better and larger than ever before.

On the fifth level some mining was done in the back of the stope in the North Deposit, and one contract raised to the elevation of the fourth level. Most of the floor in this stope has been mined, and the extent of the ore further west has been proven. At the west end of the level some floors have been mined from below.

On the sixth level two contracts are cross-cutting north from the North Deposit to reach ore found in the floor of the fifth level, one contract is mining in the back and two are mining floors. In the Fault Vein and the west end of the Main Vein two contracts have been mining the ore in the back of the sixth level and in the floor of the fifth level throughout the year.

On the seventh level in the North Deposit one contract has been mining the ore between the sixth and seventh levels at the west end of the vein, and another has mined backs and sixth level floors further east. In the Fault Vein one contract has mined backs most of the year. At the west end of the Main Vein one contract followed the ore west until it pinched out, and have been mining the ore in the back during the remainder of the year.

On the eighth level one contract mined the ore between the seventh and eighth levels at the east end of the North Deposit throughout the year. One contract followed the ore in the Main Vein west until it pinched out, and then raised in the back. Another gang mined some ore in the back of the Fault Vein early in the year.

On the ninth level in the second half of the year one contract raised in two places in the back of the Main Vein 650 to 750 feet west of the shaft, and another contract raised from the tenth level to the eighth level in the Main Vein, and opened out on the ninth level from this raise. They are drifting west in ore.

On the tenth level one contract mined ore in the back of the stopes on the north side of the main drift during the first half-year and another contract mined the ore in the back of the stopes in the south half of the deposit, and drove four cuts through pillars. Another contract has been stoping in the Fault Vein throughout the year, 900 to 1000 feet west of the shaft, and has nearly finished this ore. Two more contracts have been working in the Main Vein, one stoping next to the hanging-wall from 1300 to 1400 feet west of the shaft, and the other at the west end of the level, 2000 feet from the shaft.

On the eleventh level two contracts have worked throughout the year in the Main Vein. One mined the ore in the back of the stopes in the east part of the vein, holing to the tenth level in four places, and then drifted west through a dike on the south side of the deposit to new ore. The other contract has developed new ore 150 feet long and 50 feet wide under the hanging-wall on the west side of the same dike on the north side of the deposit. They are still going ahead in this ore.

On the twelfth level one gang mined some ore in the south-west drift, and then drifted west through the dike mentioned above on the eleventh level. They have a fine stope of ore.

On the thirteenth level the same contract as last year continued the stope to the west and turned south, so that the ore is now developed for a length of 200 feet and a width of 120 feet at the west end. The limits of the ore have not been reached. This is probably the same ore as that developed on the eleventh and twelfth levels.

CLIFFS SHAFT MINE.

COMPARISON OF COST SHEETS.

FOR 1916 and 1917.

The Cliffs Shaft Mine worked on single shift in 1916 and 1917, hoisting being done, however, on both shifts. In 1917 while the hoist was being changed and repaired, and in December, when the trestle broke down, one shaft or the other, as was necessary, was shut down and the other one worked double-shift. There was a loss of product of 7,000 tons due to this cause, and in addition the expense of much of the new construction and extraordinary repairs, carried on the E. and A's, was charged directly to the cost of production. The cost of explosives advanced materially during the year.

Wages were advanced in 1916 and 1917 as follows; February 1st, 1916, 10%; May 1st, 1916, 5%; December 15th, 1916, 10%; May 1st, 1917, 10%; October 1st, 1917, 10%. The average wages paid in 1917 were 24% higher than the average of 1916.

Production.

	Total	Per Day
Year 1916	395,320 Tons	1,318 Tons
Year 1917	367,595 "	1,221 "
Decrease	27,725 Tons	97 Tons

Labor.

	Year 1916	Year 1917
Average number of men	348	344
Average rate per day	$ 2.99	$ 3.70

Tons per Man per Day.

	Year 1916	Year 1917
Surface	18.84	15.09
Underground	4.93	4.65
Total	3.91	3.55

Cost of Production.

	Year 1916	Year 1917
Labor	.759	1.035
Supplies	.346	.459
Total	1.105	1.494

GENERAL EXPENSE.

No. 26 - Insurance.

1916	$ 161.04	$ .000
1917	158.50	.000
Decrease	2.54	.000

No. 27 - Engineering.

1916	$ 1543.53	$ .004
1917	2363.91	.006
Increase	820.38	.002

This is a Central Office charge. Salaries were higher in 1917, and there were 384¾ days charged in all in 1917 compared with 311 in 1916. Engineer's days increased from 96 to 147. The engineer looking after this work had a higher salary than his predecessor. A proportion of vault fixtures was also charged to this account in 1917.

No. 28 - Analysis.

1916	$ 2186.93	$ .006
1917	2220.33	.006
Increase	33.40	.000

No. 30 - Personal Injury Expense.

1916	$ 4970.85	$ .013
1917	6923.89	.019
Increase	1953.04	.006

Regular doctors' fees and hospital expense increased $200 in 1917, but payments for personal injury decreased $1830. In 1916 there were no fatal accidents, but in 1917 Henry Pitala was killed, and $3000 was charged to this account. The half-shift for the funeral-day cost $551.

No. 30a - Mine Office.

1916	$ 7559.70	$ .019
1917	10859.34	.030
Increase	3299.64	.011

Wages and salaries increased in 1917, and three policemen were employed instead of one watchman. The policemens' wages amounted to $3100.

MAINTENANCE.

No. 125 - Tracks and Yards.

1916	$ 1748.89	$ .005
1917	7568.56	.021
Increase	5819.67	.016

Part of the increase is due to increases in wages. The principal item is the cost of grading and planting which was charged to this account, amounting to $7000.

No. 126 - Docks, Trestles and Pockets.

1916	$ 198.18	$ .000
1917	419.41	.001
Increase	221.23	.001

New plates for pockets cost $100 in 1917 and repairs to "B" shaft trestle cost $100 in 1917.

No. 127 - Buildings.

1916	$ 2594.90	$ .007
1917	5061.48	.014
Increase	2466.58	.007

	1916	1917
Repairs to shaft-houses	$ 276.04	$ 518.23
Engine-house and boiler-house	371.28	322.20
Shops	231.88	524.81
Dry-buildings	1288.68	1572.62
Miscellaneous Buildings	159.94	1960.23

No. 128 - Shop-Machinery.

1916	$ 271.31	$ .000
1917	603.52	.002
Increase	332.21	.002

In 1916 belting cost $115.68, emery-wheels $23.22, gear $35 and labor and minor supplies for repairs $97.41. In 1917 the principal charges were $157.54 belting and balance labor charges repairing machinery.

No. 129 - Boiler Plant.

1916	$ 959.44	$ .002
1917	2292.69	.006
Increase	1333.25	.004

The increase is due to repairs to combustion chambers $84.00, grate bars and boxes $256.54, arch plates $190.00, thermometer $97.82, plates $100.00, air-hose $33.15, and $1215.50 labor repairing boilers. Balance is fire-brick and general supplies.

No. 130 - Hoisting Machinery.

1916	$ 1275.50	$ .003
1917	8556.20	.023
Increase	7280.70	.020

Due to 1 Bicycle Sheave $170.00, 1¼" Rope $1355.52, and balance gears and labor for changing, charged to E and A. 316, "Repairs to Electric Hoist."

No. 131 - Compressors and Power Drills.

1916	$ 741.35	$ .002
1917	4296.33	.012
Increase	3554.78	.010

In 1916 two drills were bought from the Holmes Mine for $200. In 1917 6 #48 Leyners cost $1650.00, 6 Tripods $158.40, and 4 #18 Leyners $1009.49. The new air-line down "A" shaft - 440 ft. 6" flanged-pipe - cost $600. Balance is in labor installing pipe and general repairs to compressors.

No. 132 - Pumping Machinery.

1916	$ 1394.43	$ .004
1917	669.95	.002
Decrease	724.48	.002

Due to maintenance charges for installation of pumps in 1916.

No. 133 - Top Tram Engines and Cars.

1916	$ 1450.71	$ .004
1917	1643.44	.004
Increase	192.73	.000

In 1916 3/4" rope cost $153.99, and in 1917 $160.42, and in 1916 an armored cable and wiring cost $80.66. In 1917 an extra 5-ton car was built.

No. 134 - Skips and Skip-Roads.

1916	$ 1771.79	$ .005
1917	2152.38	.006
Increase	380.59	.001

The increase is due to higher wages and higher prices for iron and steel used in repairing in 1917.

No. 135 - Underground Tracks and Cars.

1916	$ 8015.03	$ .020
1917	8984.01	.025
Increase	968.98	.005

The increase is due to higher wages and higher prices for rail. In 1916 71,520 lbs. rails were used @ $30.40 a ton, and in 1917 51,314 lbs. @ $49. 6 Gravel Cars from Hoose and Person cost $300 in 1917.

No. 136 - Electric Tram Plant.

1916	$ 5413.64	$ .014
1917	3759.37	.010
Decrease	1654.27	.004

In 1916 all motor cars were equipped with automatic couplers.

No. 137 - Telephones and Safety Devices.

1916	$ 1230.65	$ .003
1917	2106.95	.006
Increase	876.30	.003

In 1917 more time was spent on safety-devices underground, and supplies for fitting up the hospital-room were higher.

No. 138 - Crushing and Screening.

1916	$ 2526.40	$ .006
1917	4923.61	.013
Increase	2397.21	.007

The principal items in 1917 were as follows; 3 Screen Sections $465.00; 3 tons Cast Iron $150.00; Rotary Grizzly $830.00; Grid Plates and Rollers $221.02; Bevel Gear and Cast Iron Rings $98.71. The balance is for plates and labor for repairs.

No. 139 - Underground Shovel and Gas Car.

1916		
1917	$ 137.50	$ .000
Increase	137.50	.000

There were no charges to this account in 1916.

MINING EXPENSE.

No. 150 - Air-Pipes.

1916	$ 4357.16	$ .011
1917	5813.19	.016
Increase	1456.03	.005

In 1917 hoses were charged to this account. The principal item was 1892 feet of 3" pipe, costing $504.55, laid on the seventh level in "A" shaft. It cost about $200 to lay this pipe. Wages and cost of supplies were higher in 1917.

No. 151 - Compressors.

1916	$ 18869.67	$ .048
1917	22927.63	.062
Increase	4067.96	.014

The increase is due to higher wages paid in 1917, higher cost and poorer quality of coal.

No. 152 - Hoisting.

1916	$ 11897.16	$ .030
1917	12698.76	.034
Increase	801.60	.004

The increase is due to higher wages paid in 1917.

No. 154 - Sinking and Shaft Repairs.

1916	$ 1521.50	$ .004
1917	3520.54	.010
Increase	1999.04	.006

"A" shaft was retimbered above the ledge for 14 sets between Oct. 6 and Oct.22.

No. 155 - Rock Drifting.

1916	$ 34230.96	$ .087
1917	29726.08	.081
Decrease	4504.88	.006

In 1916 there was 2769 feet of drifting done at $12.36 per foot, and in 1917 1774 feet at $16.75. The higher cost per foot in 1917 is due to higher wages and powder cost, and especially to the high cost of the raises above the fifteenth level in "A" shaft, where the ground is extremely hard.

No. 156 - Breaking Ore.

1916	$ 154614.02	$ .391
1917	196987.02	.536
Increase	42373.00	.145

The cost in 1916 was helped out by the overrun from stock-pile. Wages in 1917 were on the average 24% higher than in 1916, and explosives increased from .134 in 1916 to .171 in 1917. In 1916 the cost per ton for drill-steel was $ .010, and in 1917 $ .016. The tons per man per day in 1916 was 13.30, and in 1917 11.80.

No. 157 - Tramming.

1916	$ 104266.80	$ .264
1917	133769.31	.364
Increase	28502.51	.100

Average wages were 24% higher in 1917 than in 1916, and the average distance trammed was longer. There was an overrun from stock-pile included in 1916 production, but none in 1917. The quality of trammers was poorer in 1917 than in 1916. In 1916 the tons per man per day trammed was 11.98, and in 1917 11.95.

No. 158 - Filling.

1916	$ 2273.68	$ .006
1917	3849.24	.011
Increase	1575.56	.005

In 1917 a larger portion of handling rock was charged to this account.

No. 159 - Timbering.

1916	$ 4541.68	$ .012
1917	4297.05	.012
Decrease	244.63	.000

The decrease is in labor and material for underground chutes. Timbermen charged more time to No. 137 in 1917.

No. 160 - Captain and Bosses.

1916	$ 9238.25	$ .023
1917	10740.81	.029
Increase	1502.56	.006

The increase is due to higher wages in 1917.

No. 161 - Dry House.

1916	$ 2368.28	$ .006
1917	3103.77	.008
Increase	735.49	.002

The increase is due to higher wages and higher cost of coal.

No. 162 - Top Landing and Tramming.

1916	$ 5149.73	$ .013
1917	6380.80	.017
Increase	1231.07	.004

The increase is due to higher wages in 1917.

No. 163 - Stocking Ore.

1916	$ 5610.25	$ .014
1917	6881.34	.019
Increase	1271.09	.005

The increase is due to higher wages and more snow to handle in 1917. Stocking trestles cost more in 1916.

No. 164 - Sorting Ore.

1916	$ 5299.74	$ .013
1917	7001.89	.019
Increase	1702.15	.006

The increase is due to higher wages in 1917.

No. 166 - Cave-In.

1916	$ 43.00	$ .000
1917	3.99	.000
Decrease	39.01	.000

No. 168 - Crushing and Screening.

1916	$ 7113.13	$ .017
1917	8477.36	.023
Increase	1364.23	.006

The increase is due to higher wages paid in 1917.

RECAPITULATION.

	Year 1916		Year 1917		Increase		Decrease	
	Total	Per Ton	Total	Per Ton	Total	Per Ton	Total	Per Ton
General Expense	16422.05	.042	22525.97	.061	6103.92	.019		
Maintenance	29592.22	.075	53175.40	.145	23583.18	.070		
Mining Expense	390626.60	.988	473592.69	1.288	82966.09	.300		
Cost of Production	476640.87	1.105	549294.06	1.494	112653.19	.389		

CLIFFS SHAFT MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR-1917.

GRADE	IRON	PHOS.	SILICA
Cliffs Shaft Lump,	58.97	.104	5.13
Cliffs Shaft Crushed,	57.88	.107	6.09

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR-1917.

	Mine		Lake Erie	
GRADE	IRON	PHOS.	IRON	MOIST.
Cliffs Shaft Lump,	58.83	.105	59.03	.58
Cliffs Shaft Crushed,	58.14	.105	58.33	2.15

ORE STATEMENT - DECEMBER 31ST,1917.

	C.SHAFT LUMP.	C.SHAFT CRUSHED	TOTAL	TOTAL LAST YEAR
On Hand Jany. 1st,1917,	13,845	28,288	42,133	98,683
Output for Year,	249,829	117,766	367,595	375,492
Stockpile Overrun,				19,828
Total,	263,674	146,054	409,728	494,003
Shipments,	226,933	121,957	348,890	451,870
Balance on Hand,	36,741	24,097	60,838	42,133
Decrease in Output-7%			27,725	
Increase in Ore on Hand			18,705	

1-8 Hr. Shift - 1916 & 1917.

SHIPMENTS FOR YEAR-1917.

GRADE	POCKET	STOCKPILE	TOTAL	TOTAL LAST YEAR
Lump Cliffs Shaft,	138,501	88,432	226,933	218,198
Crushed Cliffs Shaft,	47,553	74,404	121,957	233,672
Total,	186,054	162,836	348,890	451,870
Total Last Year,	220,178	231,692	451,870	
Decrease - 23%			102,980	

Tonnage mined from the former Cleveland Iron Mining Company's property through the Cliffs Shaft Mine during 1917.....14,430.

C.S. MINE.

CLIFFS SHAFT MINE.

COMPARATIVE MINING COST FOR YEAR.

	1 9 1 7.	1 9 1 6.	INCREASE.	DECREASE
PRODUCT	367,595	395,320		27,725
General Expense	.061	.042	.019	
Maintenance	.145	.075	.070	
Mining Expense	1.288	.988	.300	
Cost of Production	1.494	1.105	.389	
Exploratory	.015	.016		.001
DEPRECIATION.				
Original Purchase	.249	.128	.121	
Plant Account	.020	.050		.030
Equipment	.001	.001		
Construction	.005		.005	
Total Depreciation	.275	.179	.096	
Taxes	.157	.127	.030	
Central Office	.063	.049	.014	
Miscellaneous	.001	.005	.006	
Sundry Expense	.015	.013	.002	
Cost on Stockpile	2.020	1.518	.536	
Loading & Shipping	.031	.029	.002	
Total Cost on Cars	2.051	1.513	.538	
No. Days Operating	302	300	2	
No. Shifts and Hours	1-8hr	1-8hr		
Avg. Daily Product	1217	1317		100
COST OF PRODUCTION.				
Labor	1.035	.759	.276	
Supplies	.459	.846	.113	
Total	1.494	1.105	.389	

CLIFFS SHAFT.

COMPARATIVE WAGES AND PRODUCT.

	1 9 1 7.	1 9 1 6.	INCREASE.	DECREASE.
PRODUCT	367,595	395,320		27,725
No. Shifts and Hrs.	1-8hr	1-8hr		
AVG. NO. MEN WORKING				
Surface	81	69	12	
Underground	263	267		4
Total	344	386	8	
AVG. WAGES PER DAY				
Surface	3.31	2.74	.57-20.8%	
Underground	3.81	3.05	.76-24.9%	
Total	3.70	2.99	.71-23.75	
WAGES PER MO. OF 25 DAYS				
Surface	82.75	68.50	14.25	
Underground	95.25	76.25	19.99	
Total	92.50	74.75	17.75	
PRODUCT PER MAN PER DAY				
Surface	15.09	18.84		3.75
Underground	4.65	4.93		.28
Total	3.55	3.91		.36
LABOR COST PER TON				
Surface	.219	.145	.074	
Underground	.821	.619	.202	
Total	1.040	.764	.276	
AVG. PRODUCT BRK'G & TRM'G	5.94	6.30		.36
" WAGES CONTRACT MINERS	4.05	3.09	.96	
" " " TRAMMERS	3.96	3.09	.90	
" " " LABOR	4.01	3.09	.92	
TOTAL NO. OF DAYS				
Surface	24,366	20980¾	3385¼	
Underground	79,081¾	80133½		1051¼
Total	103,447¼	101114¼	2333½	
AMOUNT FOR LABOR				
Surface	80601.81	57453.52	23158.29	
Underground	301590.09	244839.24	56750.85	
Total	382201.90	302292.76	79909.14	

Proportion Surface to Underground Men:

1917 - 1 to 3.25
1916 - 1 to 3.87
1915 - 1 to 3.76
1914 - 1 to 3.59
1913 - 1 to 3.40
1912 - 1 to 4.20
1911 - 1 to 3.35

CLIFFS SHAFT MINE.

CLIFFS SHAFT MINE.

STATEMENT OF EXPLOSIVES USED FOR BREAKING ORE.

KIND.	QUANTITY.	AVERAGE PRICES.	AMOUNT 1 9 1 7.	AMOUNT 1 9 1 6.
50% Powder Red Cross	285,150	.1804	51427.87	42602.31
Total Powder	285,150	.1804	51427.87	42602.31
Fuse	411,100	5.639	2318.15	1751.82
Caps	93,300	12.84	1198.79	1056.02
Cap Crimpers	28	.38	10.45	10.13
Tamping Bags	2,500	1.40	3.50	
Total Fuse,Etc.			3530.89	2817.97
Total All Explosives			54958.76	45420.28
Product			367,595	375,592
Pounds Powder per ton Ore			.776	.8164
Cost per ton for Powder			.1399	.1134
" " Fuse, Caps,Etc.			.0096	.0076
" " All Explosives			.1495	.1210
Avg. Price per lb. for Powder			.1804	.1390

ANNUAL REPORT

OF THE

SALISBURY MINE (1917)

Production and Shipments.

The Salisbury Mine worked 302 days during the year 1917, and produced 98,999 tons of ore of all grades, an average of 328 tons per day. The top of the ore in the South-East Deposit was reached, and top-slicing was begun, causing an increase in the amount of Clinton ore produced during the latter part of the year.

The following tables show the production by grades, levels and months, and the shipments and stock-pile balances.

Table I.

Production by Grades.

Grade	Total for Year		Average per Day	
	1917	1916	1917	1916
	Tons	Tons	Tons	Tons
Bessemer	14,949	29,282	50	97
Clinton	45,567	42,636	151	141
Clinton Silica	38,483	16,957	127	56
Total Ore	98,999	88,875	328	294
Rock	5,406	12,626	18	40
Total Ore and Rock	104,405	101,501	346	334

All of the Bessemer pile was shipped and two cuts were taken in the Clinton and Clinton Silica piles.

Table II.

Shipments.

Grade	Pocket Tons	Stock-pile Tons	Total Tons
Bessemer	7,305	11,502	18,807
Clinton	13,593	37,628	51,221
Clinton Silica	6,805	30,906	37,711
Total	27,703	80,036	107,739

Table III.

Stock-pile Balances December 31st, 1917.

	1917 Tons	1916 Tons
Bessemer	1,116	5,024
Clinton	21,593	27,247
Clinton Silica	133,194	132,422
Total	155,953	164,693

Table IV.

Division of Product by Levels.

Level	Bessemer Tons	Clinton Tons	Clinton Silica Tons	Total Ore Tons	Rock Tons	Total Ore and Rock Tons
5	372	1,060	3,958	5,390	280	5,670
8	12,598	19,268	19,768	51,634	410	52,044
9	162	3,082	3,479	6,723	436	7,159
10	192	13,604	4,918	18,714	760	19,474
11	1,102	7,001	1,566	9,669	1,060	10,729
12		186	692	878	264	1,142
14	523	1,366	4,102	5,991	2,196	8,187
Total	14,949	45,567	38,483	98,999	5,406	104,405

Table V.

Distribution of Product.

Old Mine.

Level	Bessemer Ore Tons	Clinton Ore Tons	Silica Ore Tons	Total Ore Tons	Rock Tons	Total Ore and Rock Tons
Fifth	372	1,060	3,958	5,390	280	5,670
Eighth	12,598	19,268	19,768	51,634	410	52,044
Ninth	28	1,290	2,447	3,765	118	3,883
Tenth		560	330	890	20	910
Eleventh						
Twelfth		186	692	878	264	1,142
Fourteenth	523	1,366	4,102	5,991	2,196	8,187
Total	13,521	23,730	31,296	68,548	3,288	71,836

Table VI.

Distribution of Product.

South-East Deposit.

Level	Bessemer Ore Tons	Clinton Ore Tons	Silica Ore Tons	Total Ore Tons	Rock Tons	Total Ore and Rock Tons
Ninth	134	1,792	1,032	2,958	318	3,276
Tenth	192	13,044	4,588	17,824	740	18,564
Eleventh	1,102	7,001	1,566	9,669	1,060	10,729
Total	1,428	21,837	7,186	30,451	2,118	32,569

Table VII.

Production by Months.

Month	Days	Ore per Day Tons	Bessemer Ore Tons	Clinton Ore Tons	Silica Ore Tons	Total Ore Tons	Rock Tons	Total Ore and Rock Tons
January	26	326	1,610	2,292	4,584	8,486	506	8,992
February	24	288	1,292	2,870	2,748	6,910	930	7,840
March	27	292	1,992	2,474	2,882	7,348	1,224	8,572
April	23	300	1,560	2,594	2,755	6,909	408	7,317
May	26	319	2,031	2,774	3,486	8,291	322	8,613
June	25	326	1,477	2,516	4,180	8,173	208	8,381
July	24	323	941	2,944	3,879	7,764	306	8,070
August	27	351	1,480	4,053	3,958	9,491	280	9,771
September	24	348	1,079	5,432	1,850	8,361	288	8,649
October	27	366	1,228	6,410	2,250	9,888	538	10,426
November	25	355	479	4,938	3,457	8,874	270	9,144
December	24	338	450	4,960	2,702	8,112	126	8,238
Year	302	323	15,619	44,257	38,731	98,607	5,406	104,013
Stockpile overrun			392			392		392
Total		328	16,011	44,257	38,731	98,999	5,406	104,405
Transfers			-1,062	+1,310	-248			
Net Total		328	14,949	45,567	38,483	98,999	5,406	104,405

Table VIII.

Delays.

Date	Hours	Tons Lost	Cause	Cost
January 4th	5	75	Two knuckle straps broken at the knuckle.	$13.13
August 13th	3	30	No electric current.	
August 23d	3	30	Skip off the track.	2.88
Amount Forward	11	135		$16.01

Table VIII. (Continued)

Delays.

Date	Hours	Tons Lost	Cause	Cost
Amt. Brt. Fwd.	11	135		$16.01
October 6th	5¼	100	Skip-rope broke, dropping skip to collar of shaft.	28.14
December 28th	3	100	Skip off the track.	4.00
Year	19¼	335		$48.15

Table IX.

Delays Caused by Lack of Current on Main Line.

Date	Hours	Tons Lost
August 13th	3	30

Table X.

Estimate of Ore Reserves.

Level	Bessemer		Clinton		Clinton Silica		Total	
	Dev.	Pros.	Dev.	Pros.	Dev.	Pros.	Dev.	Pros.
Third					2,000		2,000	
Fourth					5,000		5,000	
Fifth			2,000		30,000		32,000	
Eighth	3,000		12,000		26,000		41,000	
Ninth			9,000		11,000		20,000	
Tenth			10,000		14,000		24,000	
Eleventh	8,000		35,000		22,000		65,000	
Twelfth	12,000		57,000		6,000		75,000	
Amt. Fwd.	23,000		125,000		116,000		264,000	

Table X. (Continued)

Estimate of Ore Reserves.

Level	Bessemer		Clinton		Clinton Silica		Total	
	Dev.	Pros.	Dev.	Pros.	Dev.	Pros.	Dev.	Pros.
Amt. Brt. Fwd.	23,000		125,000		116,000		264,000	
Thirteenth	12,000		36,000				48,000	
Fourteenth	10,000		23,000				33,000	
Sixteenth	3,000		1,000	11,000	9,000		13,000	11,000
Total	48,000		185,000	11,000	125,000		358,000	11,000
Less 20%	10,000		37,000	2,000	25,000		72,000	2,000
Rock & Loss								
Net Total	38,000		148,000	9,000	100,000		286,000	9,000

The factors used were as follows:-

Bessemer - 10 cu. ft. per ton

Clinton - 10 cu. ft. per ton

Clinton Silica - 13 cu. ft. per ton

There was a reduction made in the amount of Bessemer ore in the Old Mine. The ore was higher in phosphorus between the fifth and eighth levels in the North Vein than it was above the fifth level. Much of this ore would have gone into the Bessemer grade with a little low phosphorus ore to mix with it, but the very low phosphorus ore was exhausted about the middle of the year. This was in the South-West Deposit.

Surface.

A new electric pump for surface drainage was put in service in March, replacing the steam-pump and boiler in the swamp.

The ditch dug last year to divert the outlet of Lake Sally caved, where it was deepest, when the frost went out of the ground, and leaked a good deal. To overcome this it was lined with pipe for 280 feet, and the result has been that the flow of water from the South-East Deposit has decreased considerably.

The old Cornish pump-engine and the steam compressor were torn out and sold for scrap. The engine-room has been cleaned up and that part containing the hoist and compressor partitioned off, in order to reduce the cost of heating. The track over the coal-pocket was rebuilt in May, new stringers being put in.

On June 22d the posts in the foundation of the dry gave way, and the building settled 3 feet and nearly tipped over. It was jacked up and repaired. A first-aid room and a toilet-room were partitioned off, and shower-baths have been purchased.

The cage shaft-house in the pit was rebuilt in August, and the turn-sheave stand near the collar of the skip-shaft was also rebuilt and a new sheave installed. The foundation of the big shaft-house was also repaired.

Exploration.

Surface Diamond Drilling.

Drilling was continued in the basin south of the mine, and 4 more holes were put down. The ore-formation continued to look very promising in the south-west corner of the section, but the concentration did not increase rapidly enough to warrant further drilling. If this formation does make ore, it is close to or over our boundary-line.

Three holes were put down in the swamp between Douglas and Salisbury Streets, where old drilling had shown some ore, but no ore was found.

One short hole was drilled in the swamp north of the South-East Deposit, but this also was blank. Another short hole was drilled in the Salisbury basin east of the end of the South Vein, but no ore-formation was found.

This finishes the possibilities of ore in the formation adjacent to the Salisbury Mine. Promising formation exists further to the south-east, but it is too far away to be reached from Salisbury Mine workings. A detailed description of the work done is given in the Geologist's Report.

Underground.

Work was continued throughout the year with about the same number of men as last year. There were no new developments underground, work being confined to opening up known ore-bodies and stoping. Owing to the irregularity of the top of the ore-body in the South-East Deposit it has taken longer than was expected to get down to a satisfactory stoping basis. The ore has been very narrow and pockety, but is now worked down to a point where better results can be expected. The amount of water in the ore in this deposit has also decreased. The ore above the fourteenth level in the South-West Deposit was finished, and stoping was continued in the North and South Veins.

North Vein.

The ore in the Foot-Wall Deposit 800 feet east of the shaft was worked out, and a vein between this deposit and the Bessemer Deposit was also finished. The same contract that did this work is now mining in the shaft-pillar south of old No. 2 shaft. This is the only gang working on the fifth level.

The Bessemer Deposit has been mined from the fifth level to a sub-level 40 feet above the eighth level. The ore has been higher in phosphorus in this part of the deposit than it was above. There are three gangs working here.

South Vein.

The ore at the east end of the South Vein has been mined down to the eighth level, and mining is now being done in this ore on the ninth

and tenth levels. The ore-body is quite irregular below the eighth level, and much cut up by the old workings. There are three gangs working here.

Above the eighth level there are two gangs stoping on the 1162 Foot Sub-Level, 40 feet above the level, in the ore-body west of the south cross-cut. They have been working here about half the year, and have finished the next sub-level higher up. This ore lies in and around an old caved room, and the grade is very variable. The ore in place is mostly Clinton, but that in the crushed ground is largely Silica.

South-West Deposit.

One contract worked in the South-West Deposit during the first half of the year, and mined the ore left along the foot-wall 150 to 250 feet south-west of old No. 4 shaft. In October a mule-barn was built on both sides of the drift 60 feet south-west of No. 4 shaft.

South-East Deposit.

There are eight gangs working in the South-East Deposit, six on and above the tenth level, and two between the tenth and eleventh levels. All the ore above the tenth level has been mined, except a pillar 12 feet high in the middle of the deposit. The ore was followed to a height of 75 feet above the level near the middle of the deposit, the vertical extent being less at each end. Five sub-levels have been opened and finished in this ore above the tenth level. The ore at the east end of the deposit has been mined down to the eleventh level, and at the west end down to the 1031 Foot Sub-Level, which is 22 feet below the tenth level. This sub-level was opened during the year for the full length of the deposit, a distance of 460 feet.

There have been no changes below the eleventh level.

SALISBURY MINE.

SALISBURY MINE.

COMPARISON OF COST SHEETS.

FOR 1916 and 1917.

The Salisbury Mine worked double-shift in both 1916 and 1917. Wages were increased 10% on February 1st, 5% on May 1st and again 10% on December 15th in 1916. In 1917 there was a 10% increase in wages on May 1st and another 10% increase on October 1st.

Production.

Year 1916	88,875 Tons	294 Tons per Day
Year 1917	98,999 "	328 " " "
Increase	10,124 Tons	34 Tons per Day

Labor.

	1916	1917
Average number of men	123	118
Average rate per day	$ 3.01	$ 3.73

Tons per Man per Day.

	1916	1917
Surface	8.28	9.50
Underground	3.39	3.67
Total	2.40	2.65

Cost of Production.

	1916	1917
Labor	1.193	1.368
Supplies	.514	.489
Total	1.707	1.857

GENERAL EXPENSE.

No. 26 - Insurance.

1916	$ 195.27	$ .002
1917	219.57	.002
Increase	24.30	.000

No. 27 - Engineering.

1916	$ 697.07	$ .008
1917	734.80	.007
Increase	37.73	
Decrease		.001

No. 28 - Analysis.

The increase is due to higher wages and increased laboratory costs.

1916	$ 3286.13	$ .037
1917	3387.33	.034
Increase	101.20	
Decrease		.003

No. 30 - Personal Injury Expense.

This is a Central Office charge.

1916	$ 1097.41	$ .012
1917	845.86	.009
Decrease	251.55	.003

No. 30a - Mine Office.

The increase is due to higher wages in the office, and to policemens' wages in 1917.

1916	$ 4125.31	$ .047
1917	6337.20	.064
Increase	2211.89	.017

MAINTENANCE.

No. 125 - Tracks and Yards.

The increase is due to charges for the pipe laid in the ditch carrying the overflow from Lake Sally.

1916	$ 521.49	$ .006
1917	1542.12	.016
Increase	1020.63	.010

No. 126 - Docks, Trestles and Pockets.

Charges were higher in 1916 on account of repairs to the Clinton stock-pile ground.

1916	$ 552.60	$ .006
1917	331.78	.003
Decrease	220.82	.003

No. 127 - Buildings.

In 1917 the cage shaft-house was rebuilt, the big shaft-house repaired, and one turn-sheave stand built. The dry also had to be raised and new posts and sills put under it. A toilet and shower-baths and a hospital room were added. Repairs were also made to the engine-house.

1916	$ 617.52	$ .007
1917	2961.39	.030
Increase	2343.87	.023

No. 129 - Boiler Plant.

1916	$ 54.02	$ .000
1917	36.99	.000
Decrease	17.03	.000

No. 130 - Hoisting Machinery.

1916	$ 3342.57	$ .038
1917	3674.64	.037
Increase	332.07	
Decrease		.001

Depreciation charges were about equal for both years. In 1917 one new rope cost $474.13 and in 1916 $265.86, an increase of $208.27. Electric bell lines cost $96.18 in 1917 and boiler-house expense was higher.

No. 131 - Compressors and Power Drills.

1916	$ 2227.36	$ .025
1917	1376.45	.014
Decrease	850.91	.011

Depreciation charges were $32 lower in 1917. There were nine drills charged out in 1916 and one in 1917, a decrease of $800.

No. 132 - Pumping Machinery.

1916	$ 5657.15	$ .064
1917	3932.52	.040
Decrease	1726.63	.024

Depreciation charges were $668.61 higher in 1917 than in 1916. Surface ditches and pipe cost $1457.87 in 1917 and $2717.22 in 1916, a decrease of $1259.35.

No. 133 - Top Tram Engines and Cars.

1916	$ 96.19	$ .001
1917	170.14	.002
Increase	83.95	.001

General repairs increased $20 in 1917 and a new rope cost $51.21.

No. 134 - Skips and Skip-Roads.

1916	$ 1026.30	$ .012
1917	1037.56	.010
Increase	11.26	
Decrease		.002

No. 135 - Underground Tracks and Cars.

1916	$ 2256.38	$ .025
1917	2831.18	.029
Increase	574.80	.004

The increase is in the cost of labor repairing tracks and cars and in new plates for underground cars. Higher wages account for about $400 in labor charges.

No. 137 - Telephones and Safety Devices.

1916	$ 430.65	$ .005
1917	282.02	.003
Decrease	148.63	.002

In 1916 new wiring for lights at plats was put in, costing $148.

MINING EXPENSE.

No. 150 - Air-Pipes.

1916	$ 832.39	$ .009
1917	730.79	.007
Decrease	101.60	.002

More pipe was used in 1916 on account of development work in the South-East Deposit.

No. 151 - Compressors.

1916	$ 5029.48	$ .057
1917	5057.95	.051
Increase	28.47	
Decrease		.006

No. 152 - Hoisting.

1916	$ 6471.84	$ .073
1917	7438.94	.075
Increase	967.10	.002

The increase is due to higher wages, and more ore hoisted.

No. 153 - Pumping.

1916	$ 6008.95	$ .068
1917	4693.45	.047
Decrease	1315.50	.021

The decrease is due to less water pumped and to the greater efficiency of the pole-pump on the fourteenth level.

No. 154 - Sinking and Shaft-Repairs.

1916	$ 362.10	$ .004
1917	128.79	.001
Decrease	233.31	.003

Repairs in the shaft were much less in 1917. No sinking was done in either year.

No. 155 - Rock Drifting.

1916	$ 9281.89	$ .104
1917	4528.06	.046
Decrease	4753.83	.058

In 1916 the drifting done amounted to 1,685 feet at $5.51 per foot. In 1917 it was 697 feet at $6.50 per foot. The increase in cost per foot was due to higher wages and higher cost of powder.

No. 156 - Breaking Ore.

1916	$ 49980.27	$ .562
1917	71962.90	.727
Increase	21982.53	.165

The increases are due to more ore mined, higher wages, and higher cost of powder. Wages were increased 10% December 15th, 1916, May 1st, 1917 and October 1st, 1917 successively.

No. 157 - Tramming.

1916	$ 15445.28	$ .174
1917	20087.55	.203
Increase	4642.27	.029

The increase is due to higher wages and more ore trammed. More ore was trammed from the South-East Deposit in 1917.

No. 158 - Filling.

1916	$ 306.25	$ .003
1917	429.08	.004
Increase	122.83	.001

The amount of rock piled back in the old workings in 1917 increased in the old mine, especially in the North Vein.

No. 159 - Timbering.

1916	$ 18030.61	$ .203
1917	23291.55	.235
Increase	5260.94	.032

The increase is due to more timber used, higher prices for timber, and higher wages, and especially to work retimbering the twelfth level in the South Vein.

No. 160 - Captain and Bosses.

1916	$ 4185.26	$ .047
1917	5096.54	.052
Increase	911.28	.005

The increase is due to higher wages in 1917.

No. 161 - Dry-House.

1916	$ 1886.91	$ .021
1917	2721.05	.028
Increase	834.14	.007

The increase is due to higher wages and to higher heating charges, on account of higher cost of coal.

No. 162 - Top Landing and Tramming.

1916	$ 6056.45	$ .068
1917	6280.35	.064
Increase	233.90	
Decrease		.004

In 1916 the tons stocked amounted to 62,206 tons, and in 1917 to 70,904.

No. 163 - Stocking Ore.

1916	$ 802.99	$ .009
1917	1010.66	.010
Increase	207.67	.001

In 1916 the tons stocked amounted to 62,206 tons, and in 1917 to 70,904.

No. 166 - Cave-In.

1916	$ 376.77	$ .004
1917	134.29	.001
Decrease	242.48	.003

This covers the cost of operating one surface-pump. The steam-pump was replaced by an electric pump in 1917, and the rainfall was less in 1917 than in 1916.

No. 171 - Ventilation.

1916	$ 489.26	$ .006
1917	574.32	.006
Increase	85.06	.000

SALISBURY MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR-1917.

GRADE	IRON	PHOS.	SILICA
Salisbury Bessemer,	60.87	.047	7.24
Clinton,	58.77	.090	8.68
Clinton Silica,	52.06	.083	18.62

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR-1917.

	Mine			Lake Erie		
GRADE	IRON	PHOS.	SILICA	IRON	PHOS.	MOIST.
Clinton,	59.57	.088		59.26		13.22
Clinton Silica,	52.46	.082	18.86	51.71		12.48

ORE STATEMENT-DECEMBER 31ST, 1917.

	SALISBURY BESSEMER.	CLINTON	CLINTON SILICA.	TOTAL	TOTAL LAST YEAR
On hand Jany. 1st, 1917,	5,024	27,247	132,422	164,693	183,030
Output for Year,	14,557	45,567	38,483	98,607	88,875
Stockpile Overrun,	392			392	
Total,	19,973	72,814	170,905	263,692	271,905
Shipments,	18,807	51,221	37,711	107,739	107,212
Balance on Hand,	1,166	21,593	133,194	155,953	164,693
Increase in Output-11%				10,124	
Decrease in Ore on Hand,				8,740	

1917 - 2-8 Hr. Shifts during year.

1916 - 2-8 Hr. Shifts during year.

SALISBURY MINE.

SALISBURY MINE

SHIPMENTS FOR YEAR - 1917.

GRADE	POCKET	STOCKPILE	TOTAL	TOTAL LAST YEAR
Salisbury Bessemer,	7,305	11,502	18,807	30,841
Clinton,	13,593	37,628	51,221	19,054
Clinton Silica,	6,805	30,906	37,711	57,317
Total,	27,703	80,036	107,739	107,212
Total last Year,	26,669	80,543	107,212	
Increase,			527	

SALISBURY MINE.

SALISBURY MINE.
COMPARATIVE MINING COST FOR YEAR.

	1 9 1 7.	1 9 1 6.	INCREASE.	DECREASE.
PRODUCT	98,999	88,875	10,124	
General Expense	.116	.106	.010	
Maintenance	.184	.189	.005	
Mining Expense	1.557	1.412	.145	
Cost of Production	1.857	1.707	.150	
Exploratory	.230	.266		.036
DEPRECIATION.				
Original Purchase	.073	.019	.054	
Equipment	.002	.003		.001
Construction	.003		.003	
Total Depreciation	.078	.022	.056	
Taxes	.086	.047	.039	
Central Office	.084	.079	.005	
Miscellaneous		.002	.002	
Sundry Expense	.016	.014	.002	
Cost on Stockpile	2.351	2.133	.218	
Loading & Shipping	.068	.056	.012	
Total Cost on Cars	2.419	2.189	.230	
No. Days Operating	302	302		
No. Shifts and Hours	2-8hr	2-8hr		
Avg. Daily Product	328	294	24	
COST OF PRODUCTION.				
Labor	1,368	1.198	.175	
Supplies	.489	.514		.025
Total	1.857	1.707	.150	

SALISBURY MINE.

COMPARATIVE WAGES AND PRODUCT.

	1 9 1 7.	1 9 1 6.	INCREASE.	DECREASE.
PRODUCT	98,999	88,875	10,124	
No. Shifts and Hrs.	2-8hr	2-8hr		
AVERAGE NO. MEN WORKING				
Surface	34	36		2
Underground	90	87	3	
Total	124	123	1	
AVG. WAGES PER DAY				
Surface	3.39	2.80	.59- 21%	
Underground	3.86	3.10	.76-24.6%	
Total	3.73	3.01	.72-23.9%	
WAGES PER MO. OF 25 DAYS				
Surface	84.75	70.00	14.75	
Underground	96.50	77.50	19.00	
Total	93.25	75.25	18.00	
PRODUCT PER MAN PER DAY				
Surface	9.50	8.28	1.22	
Underground	3.67	3.39	.28	
Total	2.65	2.40	.25	
LABOR COST PER TON				
Surface	.357	.339	.018	
Underground	1.051	.915	.136	
Total	1.408	1.254	.154	
AVG. PRODUCT BRK'G & TRM'G	4.84	4.84		
" WAGES CONTRACT MINERS	4.30	3.15	1.15	
" " " TRAMMERS	3.86	2.83	1.03	
" " " LABOR	4.21	3.06	1.15	
TOTAL NO. OF DAYS				
Surface	10,422¼	10,787¾		315½
Underground	26,956	26,242	714	
Total	37,378¼	36,979¾	398¼	
AMOUNT FOR LABOR				
Surface	35,367.78	30,084.95	5,282.83	
Underground	103,015.30	81,313.43	22,701.87	
Total	139,383.08	111,398.38	27,984.70	

Proportion Surface to Underground Men;

1917 - 1 to 2.68
1916 - 1 to 2.42
1915 - 1 to 2.
1914 - 1 to 3.12
1913 - 1 to 3.49
1912 - 1 to 3.51
1911 - 1 to 3.21

SALISBURY MINE.

TIMBER STATEMENT FOR YEAR ENDING DECEMBER 31, 1917.

KIND.	LINEAL FEET.	AVG. PRICE PER FOOT.	AMOUNT 1 9 1 7.	AMOUNT 1 9 1 6.
6" to 8" Timber	58,213	.02¼	1306.00	1240.26
8" to 10" "	41,895	.0394	1653.17	990.85
10" to 12" "	23,718	.0592	1405.04	1301.73
12" to 14" "	5,822	.0806	469.22	634.83
Total 1917	129,648	.0373	4833.43	
Total 1916	117,718	.0352	4167.67	4167.67
	LINEAL FEET.	PER 100'.		
5' Lagging	303,875	.50¼	1526.63	1670.00
7' "	78,057	.55	429.31	204.79
Total Lagging (1)	381,932	.51	1955.94	1874.79
Poles	151,594	.93	1424.47	890.52
Total 1917	533,526	.63	3380.41	
Total 1916	489,945	.56		2765.31

Product	98,999	88,876
Feet Timber per ton of Ore	1,309	1,324
Feet Lagging "	5,390	4,412
" '" per foot of timber	4,115	3,333
Cost per ton for Timber	.0488	.0469
" Lagging	.0342	.0211
" Poles	.0144	.010
" Timber, Lagging & Poles	.0974	.0780
Equivalent of stull Timber to Bd.Measure	232,043	246,895
Feet Board Measure per ton of Ore	2.34	2.79

Total cost for Timber, Lagging & Poles	1917	8213.84
"	1916	6932.98
"	1915	2099.17
"	1914	8127.18
"	1913	7058.47
"	1912	6787.05
"	1911	7228.05
"	1910	7065.06

SALISBURY MINE.

STATEMENT OF EXPLOSIVES USED FOR BREAKING ORE.

KIND.	QUANTITY.	AVERAGE PRICES.	AMOUNT 1 9 1 7.	AMOUNT 1 9 1 6.
50% Powder	33,350	.1812	6045.72	4421.31
Total Powder	33,350	.1812	6045.72	4421.31
Fuse	110,100	55.79	614.19	503.55
Caps	30,050	12.86	386.47	368.04
Cap Crimpers	2	.25	.50	1.50
Total Fuse, Etc.			1004.16	873.09
Total All Explosives			7049.88	5294.40
Product			98,999	88,875
Pounds Powder per ton Ore			.337	.360
Cost per ton for Powder			.059	.049
" " Fuse, Caps.,Etc.			.010	.009
" " All Explosives			.071	.058
Avg. Price per lb. for Powder			.1812	.138

ANNUAL REPORT

OF THE (1917)

ANGELINE MINE

Production and Shipments.

Stripping was continued during most of the winter at the Happy Hollow pit, and both stripping and mining by steam-shovel were carried on during the summer and fall. The stock-pile accumulated in 1916 was shipped early in the summer. Stripping was also continued at the East End pit during the winter, and some ore was mined during the summer. There was no ore in stock at the end of the year.

Table I.

Production by Grades.

Grade	From Pits Tons	From Stockpile Tons	Total Tons
Angeline	35,493	2,060	37,553
East End	16,462		16,462
Hematite	205		205
Angeline to Pioneer #2	453	____	453
Total	52,613	2,060	54,673

Table II.

Production by Months.

Month	Happy Hollow Tons	East End Tons	Total Tons
May	1,628		1,628
June	1,879		1,879
Amount Forward	3,507		3,507

Table II. (Continued)

Production by Months.

Month	Happy Hollow Tons	East End Tons	Total Tons
Amt. Brought Fwd.	3,507		3,507
July	13,730		13,730
August		5,010	5,010
September	5,003	2,407	7,410
October		3,557	3,557
November	13,706	5,693	19,399
Total	35,946	16,667	52,613

Table III.

Estimate of Ore Reserves.

Developed Ore.

Angeline Bessemer	East End Deposit	54,000 Tons
Angeline Bessemer	Happy Hollow	2,000 Tons
Angeline Non-Bessemer	Happy Hollow	3,000 Tons
Total		59,000 Tons
Less 10% for rock and 10% loss in mining		11,800 Tons
Net Total		47,200 Tons

A factor of 10 cu. ft. per ton was used in making this estimate. No ore has been estimated in the old mine. Some ore is known to exist near No. 56 timber-raise under East Angeline Street, but its extent is not known. There is water on the seventh level and the old drifts are in too dangerous a condition to permit examination of the west part of the mine.

New Construction.

E and A. No. 350. - Hoisting Machinery.

The old engine driving the hoist was taken out and sold for scrap. In its place the reduction gears from the hoist at the Cliffs Shaft Mine have been set up, ready for the motor, which has not been received.

Exploration.

Surface Diamond Drilling.

Four holes were put down along the south side of the East End pit, two of which found ore. The known limits of the ore were extended by the drilling.

Surface.

Old Mine.

The old saw-mill shed and part of the old coal-dock were torn down during the summer. The old compressor and the hoisting engine were torn out and sold for scrap, and a partition was built across the engine-room behind the hoist. About 15 tons of scrap-iron was picked up on surface and sent to the Cliffs Shaft reclaiming yard.

A six-inch pipe-line was laid from Happy Hollow to "D" Shaft, and a small pipe was laid from "D" Shaft to the engine-house.

The Jones and Laughlin Ore Company occupied the office and barn until the middle of November, and then vacated the office. They still have a boiler in the blacksmith shop.

Happy Hollow.

Three vacant houses near the pit were torn down during the year, as they were in the way of the steam-shovel.

Stripping and Mining Operations.

Happy Hollow.

The Hoose and Person Construction Company continued stripping at

Happy Hollow during the winter, with the exception of part of February and March. A second contract was entered into with them to deepen the approach to the pit and mine the ore. Work on this contract was started in May, and the first ore was mined on May 30th. On account of the contour of the surface of the ore they were unable to complete their stripping contract before starting to mine the ore, and their loading operations were intermittent on this account. Both mining and stripping operations were delayed by falls of rock along the south side of the pit and by runs of quicksand from the east bank. This quicksand was such a serious problem that in November, in order to make it possible for the contractors to remove most of the ore remaining in the pit, a dam was built across the east end to hold back the sand. The contractors stopped work late in November, and stored their equipment at the mine.

The amount of excavation done at this pit during the year is shown in Table IV.

Table IV.

Production by Months at Happy Hollow Pit.

by Hoose and Person Construction Co.

Month	Contract #780.			Contract #835.			
	Earth Yards	Rock Yards	Total Yards	Earth Yards	Rock Yards	Total Yards	Ore Tons
January	13,954:	1,476:	15,430:				
February	4,632:	604:	5,236:				
March							
April	8,164:	1,132:	9,296:				
May	1,224:		1,224:	7,908:	1,734:	9,642:	1,628:
June	6,420:		6,420:	4,734:	416:	5,150:	1,879:
July	1,852:	553:	2,405:	2,736:	632:	3,368:	13,730:
August	4,785:	720:	5,505:	3,252:	543:	3,795:	
Amount Forward:	41,031:	4,485:	45,516:	18,630:	3,325:	21,955:	17,237:

Table IV. (Continued)

Production by Months at Happy Hollow Pit.

by Hoose and Person Construction Co.

Month	Contract #780.			Contract #835.			
	Earth Yards	Rock Yards	Total Yards	Earth Yards	Rock Yards	Total Yards	Ore Tons
Amt. Brt. Fwd.	41,031	4,485	45,516	18,630	3,325	21,955	17,237
September	469	1,660	2,129				5,003
October	2,730	972	3,702				
November	301	2,137	2,438				13,706
December							
Total	44,531	9,254	53,785	18,630	3,325	21,955	35,946

East End.

The industrial crane and orange-peel bucket were used in stripping until the end of June. This outfit made slow progress during the winter on account of the deep frost, and was able to dig to a depth of only 12 feet, as at that depth a bed of clay and hard-pan was encountered, which the orange-peel bucket would not dig. The crane was sent to the Hard Ore yard at the end of June.

In May a No. 28 Marion shovel was brought in from the Morris-Lloyd Mine, and an inclined track laid into the pit. A hoist was also installed, and six side-dump gravel cars were purchased from the Hoose and Person Construction Company and put in use. Later a trestle was built and the dump raised so that the ore from the pit could be dumped directly from the little cars into the railroad cars, and the change from stripping to mining could be made without delay.

On account of the necessity of mixing the East End ore with the Angeline ore from Happy Hollow, it was necessary to start mining before stripping was completed, and both mining and stripping operations were carried on during the remainder of the year under disadvantageous conditions.

The last ore was mined in November, but stripping was continued to the end of the year.

Table V.

Production by Months at East End Pit.

Month	Earth Yards	Rock Yards	Total Yards	Ore Tons
January	2,990		2,990	
February	2,245		2,245	
March	3,376		3,376	
April	3,117		3,117	
May	3,680		3,680	
June	6,536		6,536	
July	3,226		3,226	
August	1,065		1,065	5,010
September	1,444		1,444	2,407
October	238		238	3,557
November	494	653	1,147	5,693
December	1,913		1,913	
Total	30,324	653	30,977	16,667

Underground.

"D" Shaft.

On September 23d a wall-plate broke in "D" Shaft about 15 feet from surface, causing a small run of sand and a small cave under the shaft-house. The shaft was repaired and cleaned down, and the cave on surface filled in. Some repairing was also done in No. 56 timber-raise.

ANGELINE MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR - 1917.

GRADE	IRON	PHOS.	SILICA
Angeline,	65.72	.046	3.30
East End,	66.73	.035	2.49
East End Hematite,	55.22	.053	

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR-1917.

GRADE	Mine		Lake Erie		
	IRON	PHOS.	IRON	PHOS.	MOIST.
Angeline,	65.83	.039	65.66	.042	11.70
East End as Angeline (One Cargo)	66.49	.034	67.05	.027	7.10

ORE STATEMENT AND SHIPMENTS FOR YEAR-1917.

	ANGELINE	ANGELINE HOOSE & PERSON.	EAST END	EAST END HEMATITE	TOTAL	TOTAL LAST YEAR
On hand Jany. 1st, 1917,	1,959				1,959	1,959
Stockpile Overrun,	101				101	0
Output for Year,		35,946	16,462	205	52,613	0
Total,	2,060	35,946	16,462	205	54,673	1,959
Shipments,	2,060	35,946 X	16,462 X	205 X	54,673	0
Balance on Hand,	0	0	0	0	0	1,959
Increase in Output,					52,714	
Decrease in Ore on Hand,					1,959	

Angeline loaded by Hoose & Person from May 1st to Nov. 27th.

East End operated 2-8 Hr. Shifts Aug. 13th to Nov. 29th.

ANGELINE MINE.

ANGELINE MINE.

MINING COST FOR YEAR 1917.

	1917.	1916.
PRODUCT	52,714	1,959
General Expense	.027	
Maintenance	.002	
Mining Expense	1.174	
Cost of Production	1.203	
Exploratory	.208	
DEPRECIATION.		
Original Purchase	.158	
Plant Account	.090	
Equipment	.030	
Construction	.007	
Total Depreciation	.285	
Taxes	.025	
Central Office	.009	
Idle Expense	.032	
Sundry Expense	.005	
Cost on Stock Pile	1.587	
Loading & Shipping	.249	
Cost on Cars	1.836	
No. Days Operating	143	
No. Shifts & Hours	1-8hr	
Avg. Daily Product	369	

Detail of Production.

From Mine	101 tons
By Contract - Hoose & Persons	35,946
East End Deposit	16,667
Total	52,714

ANNUAL REPORT

OF THE

HOLMES MINE (1917)

Production and Shipments.

The Holmes Mine started hoisting ore from No. 1 shaft on March 6th, and worked 236 days, producing 68,773 tons of ore, an average of 291 tons per day. Most of the ore hoisted came from drifts and raises driven for development purposes. The work of opening the mine has been carried 230 feet above the second level, and stoping will start on the upper sub-levels early in 1918.

The following tables show the production by grades, levels, and months, and the shipments and stock-pile balances.

Table I.

Production by Grades.

Grade	Total For Year	Average per Day 10 Months
Holmes Bessemer Lump	11,923	50
Holmes Bessemer Crushed	32,936	140
Holmes Crushed	673	3
Junction Bessemer	3,576	15
Junction	19,665	83
Total	68,773	291
Rock	25,283	107
Total Ore and Rock	94,056	398

Table II.

Shipments.

	Pocket Tons	Stock-pile Tons	Total Tons
Holmes Bessemer Lump	8,957		8,957
Holmes Bessemer Crushed	14,589	14,271	28,860
Holmes Crushed	110	563	673
Junction Bessemer	2,752	146	2,898
Junction	2,791	9,546	12,337
Total	29,199	24,526	53,725

Table III.

Stock-pile Balances, Dec. 31, 1917.

Holmes Bessemer Lump	2,966 Tons
Holmes Bessemer Crushed	4,076 Tons
Junction Bessemer	678 Tons
Junction	7,328 Tons
Total	15,048 Tons

Table IV.

Division of Product by Levels.

Level	Holmes Bessemer Tons	Holmes Tons	Junction Bessemer Tons	Junction Tons	Total Ore Tons	Rock Tons	Total Ore and Rock Tons
First	19,636	270	1,430	7,277	28,613	8,284	36,897
Second	25,223	403	2,146	12,388	40,160	16,999	57,159
Total	44,859	673	3,576	19,665	68,773	25,283	94,056

Hard ore hoisted from the O.I.M. Co.'s old stope during the year amounted to 964 tons, all of Holmes Bessemer grade.

HOLMES MINE.

Table V.

Production by Months.

Month	Days	Ore per Day Tons	Holmes Bessemer Lump Tons	Holmes Bessemer Crushed Tons	Holmes Crushed Tons	Junction Bessemer Tons	Junction Tons	Total Ore Tons	Rock Tons	Total Ore and Rock Tons
Jan.									3,580	3,580
Feb.									2,783	2,783
Mar.	16	168		1,224		1,472		2,696	1,480	4,176
Apr.	23	227		2,344		2,876		5,220	760	5,980
May	26	217		3,620		2,028		5,648	1,504	7,152
June	25	206	1,676	1,948		1,532		5,156	2,164	7,320
July	25	285	2,282	3,243		1,140	466	7,131	1,672	8,803
Aug.	27	263	2,505	3,201		1,052	350	7,108	2,876	9,984
Sept.	18	269	1,513	1,811		961	564	4,849	1,432	6,281
Oct.	27	410	3,457	4,263	110	1,208	2,023	11,061	1,868	12,929
Nov.	25	387	664	4,935		381	3,688	9,668	2,928	12,596
Dec.	24	333	1,488	3,004		472	3,028	7,992	2,236	10,228
Total	236	291	13,585	29,593	110	13,122	10,119	66,529	25,283	91,812
Transfers			-1,662	+1,099	+563	-9,546	+9,546			
Net Total			11,923	30,692	673	3,576	19,665	66,529	25,283	91,812
Stock-pile Overrun				2,244				2,244		2,244
Total for Year			11,923	32,936	673	3,576	19,665	68,773	25,283	94,056

Table VI.

Delays.

Date	Hours	Tons Lost	Cause	Cost
Apr. 13th	8	150	On account of skip breaking away.	$ 559.02
Apr. 14th	4	50	On account of skip breaking away.	
Amt. Fwd.	12	200		$ 559.02

HOLMES MINE.

Table VI. (Continued)

Delays.

Date	Hours	Tons Lost	Cause	Cost
Amt. Brt. Fwd.	12	200		$ 559.02
Apr. 17th	1	25	Accident to Top Tram Puffer.	26.18
July 19th	4	60	No current.	
July 21st	4	100	Air Compressor burned out Saturday night.	61.73
Aug. 4th	2	30	Thunderstorm. No current on main line.	
Sept. 24th	16	250	Skip overwound and fell into shaft.	
Sept. 25th	16	250	Skip overwound and fell into shaft.	
Sept. 26th	16	250	Skip overwound and fell into shaft.	
Sept. 27th	16	250	Skip overwound and fell into shaft.	1,299.14
Sept. 28th	16	250	Skip overwound and fell into shaft.	
Sept. 29th	12	250	Skip overwound and fell into shaft.	
Oct. 1st	16	250	Skip overwound and fell into shaft.	
Dec. 8th	8	200	No current. Main line.	
Total	139	2,365		$ 1,946.07

Table VII.

Delays Due to Lack of Current.

Date	Hours	Tons Lost
July 19th	4	60
August 4th	2	30
December 8th	8	200
Total	14	290

Table VIII.

Estimate of Ore Reserves.

Level	Holmes Bessemer Tons	Holmes Tons	Junction Bessemer Tons	Junction Tons	Total Tons
		Developed Ore			
590 Foot Sub-Level	14,000			2,000	16,000
570 Foot Sub-Level	22,000			5,000	27,000
First Level	79,000	13,000	10,000	70,000	172,000
Total Above First Level	115,000	13,000	10,000	77,000	215,000
Second Level	65,000	25,000	30,000	205,000	325,000
Total Above Second Level	180,000	38,000	40,000	282,000	540,000
Less 20% Loss in Mining and Rock	36,000	8,000	8,000	56,000	108,000
Net Total Developed	144,000	30,000	32,000	226,000	432,000
		Probable Ore Partly Developed			
Third Level	181,000	60,000	43,000	202,000	486,000
Fourth Level	181,000	60,000	20,000	123,000	384,000
Total Partly Developed	362,000	120,000	63,000	325,000	870,000
Less 20% Loss in Mining and Rock	72,000	24,000	13,000	65,000	174,000
Net Total Partly Developed	290,000	96,000	50,000	260,000	696,000
Total Ore Reserves	434,000	126,000	82,000	486,000	1,128,000

Factors Used:-

Hard Ore - 9 cu. ft.

Soft Ore - 11 cu. ft.

HOLMES MINE.

Accidents to Equipment.

Compressor.

On July 21st the high-pressure cylinder on the compressor ran hot, and was burned out. The old cylinder was repaired, but was replaced later by a new one.

Skips.

On April 13th the south skip froze to the runners in the shaft 500 feet from surface, and, when hoisting was started, fell away, breaking the rope and wrecking itself and the "dribbler-skip" below the pocket.

On September 22d, shortly after 4:00 P.M. the north skip was over-wound, breaking the rope. The skip fell back into the shaft, striking and bending every other dividing from the collar to the bottom of the shaft. The bent dividings had to be taken out and straightened, and all the casing replaced. The mine was shut down from September 22d to October 2d on account of the accident. The loss of product amounted to 1,750 tons. Both the skip and the "dribbler" were badly bent by the fall.

New Construction.

E and A. No. 299.

Surface.

The dry was completed during the first half-year and put in service.

The grounds around the office, engine-house, dry and shops were graded and planted during the summer, and a good road was built to Excelsior Street.

The shop-building was completed early in the year and the machinery installed. Most of this equipment came from the Angeline Mine.

The skip-hoist was completed in January, and the engine-house was finished early in the spring.

The erection of the steel-work for the shaft-house was completed by Worden and Allen in February, after the temporary shaft-house had been taken down.

Several changes were necessary in the structure, and the installation of machinery, chutes, doors, etc., continued until late summer. The revolving screens and elevator were not received until April and July, and one of the crushers was defective, and had to be partly replaced.

Stock-pile trestles were built in January and February, and in the fall these were extended and others added, giving room to stock six grades of ore and to dump rock. Sollar plank was laid during the summer.

The temporary buildings were all torn down or moved. The office was converted into a sample-room, electrician's shop and tool-house. The boiler-house was rebuilt as a storage-shed for bulk supplies, such as iron and steel, castings, ladders, etc. A shed for salt and cement was also built. The shaft-mens' dry was converted into a dry for the surface-men, and the engine-house was demolished. One hoist was shipped to the East End pit of the Angeline Mine, and the other hoist, as well as buckets, temporary shaft-house, dumps, cross-heads, etc. was sent to the Barnes and Hecker Mine.

The L.S. & I. Ry. finished laying the service tracks in June, and shipments from the pocket started on July 2d. Stock-pile tracks were added later.

Underground.

The shaft was completed to a depth of 1,116 feet on January 13th, having been sunk 34 feet since the first of the year, and on the same day the cross-cut from the Section 16 Mine was stopped. The cross-cut from the shaft holed to this cross-cut on January 30th, but there was a difference of elevation between the two cross-cuts, and it cost $2700 and took two weeks to correct the error.

The pockets and plat on the second level were completed in February and the track laid to the Section 16 line. At the same time the 12-inch pipe for the counter-weight was installed and the 6-inch air-line was continued to the second-level.

Beginning in March a drift was driven around the shaft at the timber-tunnel and the surface water was cut off with concrete.

Later in the year the pocket at the first level was built and the plat started. The cross-cut to the shaft on the first level was started in July from the top of a raise near the foot-wall, and had been driven 20 feet in jasper and 690 feet in diorite before the end of the year. The breast was 145 feet from the shaft on the first of the year. At the same time a cross-cut was driven south 120 feet in jasper from the top of the same raise to the end of the ore-drift on the first level.

Development.

First Level. Hard Ore.

The first level was opened from raises put up from the second level mostly in the hard ore vein. From these raises a drift was driven for the full length of the hard ore vein, a distance of 600 feet from the south-east corner of the property to the west end of the ore. From the west end of the ore the drift turns to the north for 200 feet in jasper, and has been extended 690 feet further in diorite. This drift will hole to the shaft about February 1st. The hard ore attains a maximum width of 30 feet on this level, but is wider on the sub-levels above. The west 200 feet of the hard ore vein is being mined in a back-stope, which is now up 60 feet, the ore being 8 to 10 feet wide and dipping at about 50° to the south. There are three contracts working in this stope. East of this stope it is planned to mine the ore by slicing on sub-levels. Five raises have been put up in this ore from the hard ore drift, and two others, which have been put up from drifts in the soft ore, have gone into the hard ore vein at higher elevations.

Soft Ore.

The soft ore deposit has been developed by drifts and cross-cuts, and has been found to be triangular in outline and 200 feet in extent both north and south and also east and west. Two raises besides those mentioned above are being put up to the upper sub-levels, and one drift is being driven.

About one-eighth of the ore is of Bessemer grade.

The ore-formation near the foot-wall has been also explored, but practically no merchantable ore was found there.

Sub-Levels Above the First Level.

590 Foot Sub-Level.

This sub-level has been developed for a length of 180 feet west from the east boundary of the property. The hard ore is 35 feet wide at this elevation, but the soft ore is very small, and near the boundary is poor in quality. Three gangs are working on this sub-level, one drifting west in the hard ore, and the other two raising and drifting in the soft ore.

570 Foot Sub-Level.

This sub-level has been developed for a length of 280 feet west from the east boundary. The hard ore is 45 feet wide at the widest point, but gets very narrow at the west end. The soft ore is larger than on the sub-level above, being 150 feet long and about 20 feet wide. There are three contracts working in the hard ore on this sub-level, two drifting and one raising.

555 Foot Sub-Level.

This is a small sub-level next to the east boundary, where the ore pitches across the line from the Section 16 Mine. Two contracts are mining the hard ore vein. A cross-cut was driven north in the soft ore formation along the boundary, but found only lean ore.

535 Foot Sub-Level.

This is a small sub-level opened near the west end of the hard ore vein next to the stope mentioned under the heading of the first level. The limits of the ore-body have not been determined. One contract is raising from the sub-level, and is up 60 feet in good ore.

Second Level.

Hard Ore.

The hard ore vein was developed by the drift driven by the O.I.M. Co. for a length of 700 feet north-west from the south-east corner of the property. The average width of the ore is about 16 feet.

The East 180 feet of the vein has been partly mined as a shrinkage stope by the O.I.M. Co., and some of the ore left in this stope is being recovered. It is not, however, much cheaper than mining ore in place. From the hard ore drift 9 raises have been put up to the first level, and two others have been put up half-way. Shrinkage stopes 17 feet long and as wide as the vein have been opened around six of these raises, and it was from these stopes that much of the hard ore produced during the year came. One gang only is now working in the hard ore. They are taking ore from the O.I.M. Co.'s stope at the east end of the vein.

Soft Ore.

The ore on the foot-wall at the cross-cut to the shaft was developed for a length of 380 feet, and four raises were put up in it. A sub-level was opened for the full length of the ore at an elevation of 30 feet above the level, proving up the top of the ore-body, which does not extend higher than the back of the sub-level drift. The east drift along the foot-wall on the main level was continued in jasper for 340 feet, and ore was opened again at the east end, the total length of the drift being 880 feet. Two raises were put up in this east ore, one going to the second level. The ore is rather irregular both in outline and in analysis.

Early in the year a cross-cut was driven north-east from the hard ore drift, 230 feet from the east boundary-line, for a distance of 210 feet. About half this cross-cut is in ore. A drift has also been driven east from this cross-cut almost to the boundary, and two cross-cuts driven south from this drift, developing the soft ore near the boundary. The ore area is larger than on the first level, but is irregular in outline and is cut up by dikes. One gang is continuing this development.

General Mining Conditions.

Most of the work done in the ore-bodies during the year has been in the nature of development, with consequent low production per man and high costs. The ore has now been opened so that early in 1918 systematic stoping can be started from the top, and the product should be materially increased. This stoping will be concentrated largely in the hard ore. When the first level plat is finished about March 1st, 12 men will be released for breaking ore, and the amount of rock hoisted will be much reduced. The number of contracts now working is 19.

The O.I.M. Co. is opening the 1250 foot level of the Section 16 Mine south of our boundary, and are developing a splendid ore-body at this elevation. This level is 170 feet below our second level, and will be of material advantage to us both in draining and developing the ore-body.

HOLMES MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR - 1917.

GRADE	IRON	PHOS.	SILICA
Holmes Ore,	62.60	.068	
Holmes Bessemer,	62.14	.034	6.49
Holmes Bessemer Lump,	62.66	.028	6.25
Junction Bessemer,	62.29	.061	6.05
Junction Ore,	58.43	.092	

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR THE YEAR-1917.

	Mine		Lake Erie		
GRADE	IRON	PHOS.	IRON	PHOS.	MOIST.
Holmes Bessemer,	62.07	.030	62.64	.032	2.72

ORE STATEMENT - DECEMBER 31ST, 1917.

	HOLMES BESS.LUMP	HOLMES BESS.CRUSHED	HOLMES CRUSHED	JUNCTION BESSEMER	JUNCTION	TOTAL
Output for Year,	11,923	30,692	673	3,576	19,665	66,529
Stockpile Overrun,		2,244				2,244
Total,	11,923	32,936	673	3,576	19,665	68,773
Shipments,	8,957	28,860	673	2,898	12,337	53,725
Balance on Hand,	2,966	4,076	0	678	7,328	15,048
1917 - 2-8 Hr. Shifts -	Began operating March 14th, 1917.					

SHIPMENTS FOR YEAR-1917.

GRADE	POCKET	STOCKPILE	TOTAL
Holmes Bessemer Lump,	8,957		8,957
Holmes Bessemer Crushed,	14,589	14,271	28,860
Holmes Crushed,	110	563	673
Junction Bessemer,	2,752	146	2,898
Junction,	4,593	7,744	12,337
Total,	31,001	22,724	53,725

HOLMES MINE.