

AGNEW MINE  
ANNUAL REPORT  
YEAR -1949

4. ESTIMATE OF ORE RESERVES:  
(Continued)

c. Analysis of Ore Reserves:

	Non-Bess. Ore	Iron	Phos.	Sil.	Mn.	Alu.	Moist.	Fe. Nat.
NE-NE 11,57-21	996,798	58.13	.053	8.21	.75	1.42	14.50	49.70

5. LABOR & WAGES:

a. Comments:

The labor supply was ample throughout the year, but there continued to be a shortage of experienced miners. A program of training available men continued and no serious shortage developed for present operations. Although a general strike occurred in the area, over pensions, local labor relations with the Union were good.

b. Comparative Statement of Production & Wages:

<u>Production:</u>		
Direct Ore, -----		280,401 tons
Number of Days Operated, -----		249
Average Daily Production, -----		1,126.1 tons
Average Number of Men Working, -----		95-1/4
Tons Per Man Per Miner, -----		24.24
Tons Per Man Total Underground, -----		14.33
Tons Per Man Total Mine, -----		10.88
<u>Average Rate per Day:</u>		
Surface, -----		\$ 12.10
Underground, -----		\$ 13.98
Contract Miners, -----		\$ 15.38
Total Mine, -----		\$ 13.89
Amount Paid for Labor, -----		\$334,486.80
Labor Cost per Ton, -----		\$ 1.345

6. SURFACE:

a. Buildings, Repair:

Maintenance repairs to all mine buildings were carried on throughout the year.

b. Roads, Transmission Lines, etc:

A few small changes in timber yard roads were completed.

AGNEW MINE  
ANNUAL REPORT  
YEAR- 1949

7. UNDERGROUND  
MINING:

a. Shaft:  
Minor repairs to shaft timbers and complete change of all four head sheaves.

b. Development:  
No extensive development. A few short drifts and raises to open up new blocks for mining.

c. Mining:  
Mining was carried forward during the year with an average of twelve gangs employed. Of these twelve gangs, eight mined by slicing; two by sub-level caving and two on drifting and raising for developing blocks for mining. Pillars were carried back in an orderly manner on the various sub-levels. The average height of slices was 14 feet and varied in width from 10 feet to 12 feet. In the caving places, 28 feet was the maximum height. A few small pillars left by Oliver Iron Mining Company in cross-mining operations along the north line, were recovered, but severe floods made this work impracticable and it was temporarily abandoned.

There were no cross-mining operations during the year.

During the strike, which lasted from September 30th to November 14th, every precaution was taken to keep the mine in shape for immediate re-opening. Pumping, shaft repair, and drift maintenance was carried forward and operations were resumed immediately upon cessation of the strike.

d. Timber, Explosives, etc:  
The supply of timber was ample and of good quality.

Lineal feet timber used per ton of ore produced	0.750
Cost per ton for timber	\$0.110
Cost per ton for lagging, poles and boards	\$0.120
Cost per ton for wire	\$0.016
Pounds of explosives per ton	0.470
Cost per ton of ore produced for explosives	\$0.080

e. Pumping and Drainage:  
Pumping costs, although still abnormally high at this property, declined from \$.175 in 1948 to \$.165 in 1949. This was due to the Hanna Company taking over the cost of pumping from South Agnew property during the last two months of the year. With this company also installing a pump in the old Morton shaft, due to their expanding operations in this area, it is expected that the serious water problem in the Agnew Mine will be diminished considerably. During the past year, due to severe rainstorms in July,

AGNEW MINE  
ANNUAL REPORT  
YEAR 1949

7. UNDERGROUND  
MINING:  
(Continued)

e. Pumping and Drainage: (continued)  
causing floods from both the South Agnew pit and the Hull-Rust pit, considerable production was lost and a cost of \$.024 per ton was incurred through cleaning up mud washed into the mine with this water.

8. COST OF  
OPERATION:

a. Comparative Cost Statement:

<u>Product:</u>	1949 <u>Budget</u>	* 1949 Cost <u>Per Ton</u>	1948 Cost <u>Per Ton</u>
Direct Ore, -tons	300,000	280,401	327,136
<u>Underground Costs:</u>			
Exploring in Mine,	\$ .020	\$ .032	\$ .018
Stoping,	.777	.813	.762
Timbering,	.350	.339	.338
Tramming,	.131	.138	.129
Ventilation,	.014	.009	.010
Pumping,	.183	.165	.175
Compressors and Air Pipes,	.023	.030	.025
Underground Superintendence,	.053	.067	.054
Cave-in or Fire in Mine (Flood)	.000	.024	.000
Maint: Compressors and Power Drills,	.018	.014	.018
Scrapers and Mech. Loaders,	.053	.065	.050
Tramming Equipment,	.020	.022	.021
Pumping Machinery,	.032	.014	.029
<u>Total Underground Costs,</u>	<u>\$ 1.674</u>	<u>\$ 1.732</u>	<u>\$ 1.629</u>
<u>Surface Costs:</u>			
Hoisting,	\$ .041	\$ .039	\$ .041
Stocking Ore,	.018	.028	.020
Dry House,	.046	.048	.045
General Surface Expense,	.041	.040	.039
Maintenance: Hoisting Equipment,	.006	.008	.005
Shaft,	.006	.003	.006
Top Tram Equipment,	.000	.002	.001
Docks, Trestles & Pockets,	.001	.002	.001
Mine Buildings,	.002	.001	.002
<u>Total Surface Costs,</u>	<u>\$ .161</u>	<u>\$ .171</u>	<u>\$ .160</u>



AGNEW MINE  
ANNUAL REPORT  
YEAR 1949

8. COST OF  
OPERATION:  
(Continued)

	1949	*	1948 Cost
	<u>Budget</u>	<u>1949 Cost</u>	<u>Per Ton</u>
a. <u>Comparative Cost Statement: (cont'd)</u>		<u>Per Ton</u>	<u>Per Ton</u>
<u>General Mine Expenses:</u>			
Geological,	\$ .001	\$ .000	\$ .002
Mining Engineering,	.015	.009	.013
Mech. & Elec. Engineering,	.007	.009	.007
Analysis and Grading,	.012	.014	.013
Safety Department,	.007	.008	.006
Telephones & Safety Devices,	.005	.002	.005
Special Expense,	.003	.004	.004
Ishpeming Office,	.002	.005	.004
Mine Office,	.069	.072	.070
Insurance,	.015	.021	.014
Personal Injury,	.021	.017	.031
Social Security Tax, ..	.023	.019	.023
Employees Vacation Pay,	.028	.034	.028
Hibbing Office,	.007	.037	.018
<u>Total General Mine Expenses,</u>	<u>\$ .215</u>	<u>\$ .251</u>	<u>\$ .238</u>
<u>Cost of Production,</u>	<u>\$ 2.050</u>	<u>\$ 2.154</u>	<u>\$ 2.027</u>

\* Final cost figures from Cleveland.

The cost of production for 1949 was \$.104 higher than the budget and \$.127 higher than the 1948 cost. These increases were in both cases proportionately spread throughout all captions, viz: "Total Underground Costs", "Total Surface Costs" and "General Mine Expenses", and were higher due, in most part, to disruption of operations with resultant lower production by general strike, lasting six weeks, and also to loss of production with extra cost from severe floods in July.

Under the caption "Total Underground Costs", the item 'Exploring in Mine' was \$.012 higher than the budget and \$.014 higher than the 1948 cost, due to unexpected difficulty in drilling.

The cost for "Floods" of \$.024 was not experienced in 1948 and, therefore, no provision made in the budget for this item.

Under the caption "General Mine Expenses" the item 'Hibbing Office' was \$.030 higher than the budget and \$.019 higher than the 1948 cost. In making up the budget for 1949 the mine cost sheet for 1948 was used, which showed a cost on this item of \$.006.



AGNEW MINE  
ANNUAL REPORT  
YEAR- 1949

8. COST OF  
OPERATION:  
(Continued)

a. Comparative Cost Statement: (cont'd)

A budget cost was set up of \$.007 for 1949. When adjusted costs for 1948 were received, this item had been raised to \$.018. The mine cost sheet for 1949 showed this item to be \$.021 and Cleveland adjusted this to \$.037.

9. MAINTENANCE  
AND REPAIR:

A continuous program of maintenance and repair was carried on throughout the year as the need arose.

10. EXPLORATION  
AND FUTURE  
EXPLORATION:

A drilling program, with the E. J. Longyear Company drilling from underground contract, was continued in 1949 and completed on June 20th. A total of nine holes were drilled from the main level, with a total of 824 feet drilled. This drilling program did not show up any additional ore, but did prove up and outline definitely an ore body below the main level. The average overall cost for this program was \$10.99 per foot.

11. TAXES:

The following is a statement of the taxes for the years 1949 and 1948:

	<u>1949</u>	<u>1948</u>	<u>Increase</u>	<u>Decrease</u>
Agnew Mine,	\$16,693.98	\$19,248.94		\$2,554.96
Personal Property,	352.64	496.93		144.29
Total,	\$17,046.62	\$19,745.87		\$2,699.25
Average Tax Rate,	98.61	84.04	14.57	

The decrease in ad valorem taxes is due to the reduction in the reserve tonnage by the amount of shipments during the 1949 ore season.

The decrease in personal property taxes is accounted for by the fact that there was more ore in stockpile in 1948 than in 1949.

The increase in the rate for County and School District is largely responsible for the increase in the tax rate.

AGNEW MINE  
ANNUAL REPORT  
YEAR- 1949

12. ACCIDENTS AND  
PERSONAL INJURY:

There were seven lost-time accidents at this property during the year 1949 and these are described as follows:

Nick Novelich, miner . Injured February 12th. Nevolich had fastened the cables to a 12' prop timber and his partner started to pull with the tugger before notifying him. The end of the timber swung around and struck Nevolich on the chest, bruising same.

John Mosca, Miner. Injured March 17th. Mosca was standing between timber piles when tractor pulling timber truck came along, the timber truck caught a 10' mining pole, pushing it into a pile of 8' cribbing, squeezing Mosca's right leg against another pile of timber.

Bozo Perkovich, miner. Injured June 2nd. Perkovich was working near the breast when a chunk rolled down, striking him on his right foot.

Anthony Angelo, miner. Injured June 9th. Angelo was carrying powder to use for blasting, when a chunk of ore fell from the side, hitting him on his left foot.

Paul Lulich, timberman. Injured August 2nd. While Lulich and his partner were lifting a prop, Lulich twisted his back.

John Nikula, miner. Injured December 27th. Nikula was putting up a brace on a post when a chunk fell from the side, striking him on his back.

Arnold Marsyla, miner. Injured December 19th. Marsyla was operating the tugger with his knees close to the tugger. The scraper hit a hard spot, causing tugger to move backward, striking Marsyla on the right knee.

13. PROPOSED NEW  
CONSTRUCTION:

No new construction contemplated.

14. EQUIPMENT RECEIVED  
AND PROPOSED NEW  
EQUIPMENT:

The following equipment was purchased and put into use in 1949:

- 1 - Model 1-4 International rubber-tired tractor with snow plow
- 2 - Joy AF-211 15 H.P. Double-drum scraper hoists.
- 1 - No. 25 Ingersoll-Rand Sump pump
- 1 - RB-12 Ingersoll-Rand Jackhammer.

Proposed New Equipment

- 2 - 2 H. P. Blowers
- 2 - 15 H.P. Double-drum Scraper Hoists.



ATKINS MINE  
ANNUAL REPORT  
YEAR 1949

1. GENERAL:

The stripping, stockpile loading, and pit operations were carried forward regularly through the year, except during the strike period from September 29th to November 14th.

The stripping operations continued in January and until February 21st, at which time the equipment was moved to the shop area and repaired. During this period, the pit conveyor system, which had been abandoned in 1948, was also dismantled.

Stockpile loading was started on March 28th, and completed on April 18th. Pit operations then commenced, first with pit clean-up and then ore production until operations were interrupted by a strike on September 29th. Upon termination of the strike on November 14th, stockpile loading was started; a one-shift, five-day per week pit operation was also worked until December 9th, effecting pit cleanup and cutting drainage ditches in ore on both sides of the pit.

2. PRODUCTION,  
SHIPMENTS &  
INVENTORIES:

a. Production by Grades:

Atkins-Merritt, -----	✓ 47,674 tons
Atkins Extension Lease, -----	✓ 405,547 "
Total, -----	453,221 "

b. Shipments:

Atkins Bessemer - Merritt, -----	643 "
Atkins Non-Bessemer - Merritt, -----	44,424 "
Atkins N. B. Extension Lease, -----	<u>377,190 "</u>
Total, -----	✓ 422,257 "

c. Stockpile Inventories:

As of January 1, 1949, there were in stock at the Atkins Mine, 51,558 tons of ore, which was completely loaded out by April 18th. Intermittent stocking and loading was conducted throughout the season and, on December 31st, there were 82,522 tons of ore in stockpile.



ATKINS MINE  
ANNUAL REPORT  
YEAR 1949

2. PRODUCTION,  
SHIPMENTS &  
INVENTORIES:  
(Continued)

d. Production by Months:

Month	ATKINS	ATKINS	TOTAL
	MERRITT	EXTENSION LEASE	
April		13,865	13,865
May	2,676	76,749	79,425
June	27,863	57,649	85,512
July	3,154	77,508	80,662
August	2,198	101,331	103,529
September	11,783	52,468	64,251
November		18,009	18,009
December		7,968	7,968
Total,	47,674	405,547	453,221

f. Ore Statement:

Ore production continued until December 9th, bringing the stockpile balance to 82,522 tons.

3. ANALYSIS:

b. Tonnage and Analysis of Direct Ore Production:

	Tons	Iron	Phos.	Silica	Mang.	Alu.	Moist.	Fe. Nat.
Atkins Bessemer Merritt,	643	61.78	.047	5.74	.37	1.45	17.70	50.84
Atkins Non-Bess. Merritt,	47,031	53.46	.083	11.05	.86	3.86	19.06	43.27
Atkins N. B. Ex- tension Lease,	405,547	50.66	.115	11.70	1.33	5.53	19.17	40.95
Total,	453,221	50.97	.111	11.62	1.28	5.35	19.16	41.20

c. Tonnage and Analysis of Shipments:

Atkins Bessemer Merritt,	643	61.78	.047	5.74	.37	1.45	17.70	50.84
Atkins Non-Bess. Merritt,	44,424	53.65	.083	10.81	.86	3.86	19.06	43.42
Atkins N.B. Ex- tension Lease,	377,190	50.26	.113	11.60	1.28	5.62	19.52	40.45
Total,	422,257	50.64	.107	11.47	1.24	5.45	19.55	40.74

d. Tonnage & Analysis of Ore in Stockpile:

Atkins Exten- sion Lease,	79,915	49.63	-	13.67
Atkins-Merritt,	2,607	50.28	-	15.08

ATKINS MINE  
ANNUAL REPORT  
YEAR 1949

3. ANALYSIS:  
(Continued)

e. Complete Analysis of Shipments:

	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Mang.</u>	<u>Alu.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss</u>
Atkins Bess. Merritt,	61.78	.047	5.74	.37	1.45	.35	.20	.010	3.28
Atkins N. B. Merritt,	53.65	.083	10.81	1.86	3.86	.35	.20	.010	6.64
Atkins N.B. Ext.	50.26	.113	11.60	1.28	5.62	.35	.21	.010	8.25

4. ESTIMATE OF ORE RESERVES:

a. Developed Ore:

Factors:

	<u>Cu. Ft. Per Ton Crude</u>	<u>Rock Deduction</u>	<u>Percent Recovery</u>
No. 1 Ore,	14	10%	100.00
No. 2 Ore,	14	10%	100.00

	<u>Reserve 12-31-48</u>	<u>Mined 1949</u>	<u>Balance after Mining</u>	<u>Changed By Re- Estimate</u>	<u>Reserve 12-31-49</u>
<u>Merritt:</u>					
SE-NW 12-58-19	41,635	51,130	- /	13,836	4,341
<u>Wade:</u>					
NE-SW 12-58-19	500,427	224,489	275,938 -	24,200	251,738
NW-SE 12-58-19	382,857	177,602	205,255 /	50,666	255,921
<u>Total Wade</u>	<u>883,284</u>	<u>402,091</u>	<u>481,193 /</u>	<u>26,466</u>	<u>507,659</u>
<u>Grand Total,</u>	<u>924,919</u>	<u>453,221</u>	<u>471,698 /</u>	<u>40,302</u>	<u>512,000</u>

c. Estimated Analyses:

	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Mang.</u>	<u>Alum.</u>
<u>Merritt:</u>						
SE-NW 12-58-19 No.1 Ore	3,070	56.47	.090	8.92	.70	2.14
No.2 Ore	1,271	50.37	.130	8.07	1.96	6.03
<u>Total Merritt,</u>	<u>4,341</u>	<u>54.68</u>	<u>.102</u>	<u>8.67</u>	<u>1.07</u>	<u>3.28</u>

ATKINS MINE  
ANNUAL REPORT  
YEAR 1949

4. ESTIMATE OF ORE RESERVES:  
(Continued)

c. Estimated Analyses: (continued)

	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Mang.</u>	<u>Alum.</u>
<u>Wade:</u>						
NE-SW 12-58-19 No.1 Ore	202,620	56.49	.090	8.89	.70	2.12
No.2 Ore	49,118	50.35	.129	7.95	2.05	5.99
NW-SE 12-58-19 No.1 Ore	101,310	57.98	.080	7.90	.74	2.37
No.2 Ore	154,611	49.68	.116	11.01	1.46	6.07
Total Wade,	507,659	54.12	.100	9.25	1.07	3.75
Total No. 1 Ore,	307,000	56.98	.087	8.56	.71	2.20
Total No. 2 Ore,	205,000	49.36	.118	10.16	1.59	6.05
Grand Total	512,000	54.12	.100	9.24	1.07	3.77

The reserve shown as of December 31, 1949, represents the entire tonnage of shipping grade ore remaining in the Atkins Mine. It is anticipated that this will be mined out during the 1950 season.

5. LABOR & WAGES:

a. Comments:

An ample supply of labor was available in the Kinney district the entire season. A general strike in the steel industry over pensions and insurance halted operations between September 29th and November 14th.

b. Comparative Statement of Production and Wages:

PRODUCTION:

Direct Ore, -----	453,221 tons
Number of Days Operated, -----	160
Average Number of Working Men, -----	45 1/2
Average Wages Per Man, -----	12.54
Production Per Man Per Day, -----	60.18
Labor Cost Per Man Per Ton, -----	.208
Total Number of Man Days, -----	7,531
Amount Paid for Labor, -----	\$ 94,076.05 - 94,454.03

6. SURFACE:

a. Buildings, Repairs:

No buildings were constructed during the year and only minor repairs were required on the old buildings.

b. Roads, transmission Lines, etc:

Changes in operating pit roads were made as conditions demanded; no transmission or telephone line changes were necessary.



ATKINS MINE  
ANNUAL REPORT  
YEAR 1949

7. OPEN PIT:

a. Stripping:

The stripping program, which was started in 1948 on completion of that season's ore production, was continued in January and until February 21st, on a 20-shift per week basis. The equipment was then moved to the shop for repairs. During this January-February period, 161,036 cubic yards were stripped in 138-1/2 operating shifts, resulting in 1,163 cubic yards per shift. A Bucyrus 54-B electric shovel and 15-ton trucks were used. The 1949 cost on this program was \$.437 per cubic yard as compared with a total average of \$.359. Considering the long truck haul and severe weather conditions, the cost was satisfactory.

The following tabulation shows the total stripping completed during the year:

E&A #AT-7 Wade Extension,            161,036 cubic yards.

b. Open Pit Mining:

On April 18th, pit cleanup of waste materials and ore mining started on a 2-shift, 5-day per week basis, ore operations continued until the strike on September 29th. Upon the termination of the strike, ore operations were resumed on a 1-shift, 5-day per week basis, cleaning up the pit and cutting drainage ditches on each side of the pit bottom. In the 196 shifts operated, 453,221 tons of ore were mined, averaging 2,312 tons per shift. A production cost of \$.526 per ton was obtained; this comparing favorably with the 1948 cost of \$.523, considering the increased truck haul and the narrowing pit bottom which slowed truck movement and shovel loading.

Production from the Merritt property, which is owned in fee by the Inland and Cliffs, was 47,674 tons, and 405,547 tons were mined from the Wade Extension.

Dangerous sloughing from the north wall of the pit permitted west-end loading only during daylight. No serious caving occurred, however, until October, when operations were temporarily stopped, due to the strike, then the north bank at the west end caved, cutting off and filling a large portion of the sump.

During the season, when mining operations were conducted in the restricted west end area, it was necessary to operate a second shovel in the east end of the pit to maintain production.

In conjunction with ore operations, 30,324 tons of waste material and 6,912 tons of lean ore were removed from the pit and placed on the proper stockpile.

Deeper operations in the pit bottom and the necessity of digging successive sumps under difficult water conditions, resulted in increased pumping costs. The cost of pumping for 1949 was \$.052 per

ATKINS MINE  
ANNUAL REPORT  
YEAR 1949

8. OPEN PIT:  
(Continued)

ton ore produced compared to \$.026 in 1948. The cave-in of the north bank into the sump area makes a new sump one of the first 1950 operating requirements.

9. MAINTENANCE  
AND REPAIR:

Upon termination of stripping operations on February 21st, 1949, the equipment was brought to the shops for repair. On the 54-B shovel, such parts as required attention were replaced or repaired; similarly, the trucks and tractors were overhauled and/or repaired. During operations throughout the year maintenance and repairs were completed as required.

10. COST OF  
OPERATION:

a. Comparative Mining Cost Statement:

	1949 COST PER TON 453,221 Tons	1948 COST PER TON 483,705 Tons
<u>Direct Ore:</u>		
Drilling and Blasting,	\$ .000	\$ .003
Power Shovels Operating	.037	.044
Power Shovels Maintenance	.021	.011
Trucks Operating	.075	.070
Trucks Maintenance	.090	.069
Tractors Operating	.013	*
Tractors Maintenance	.034	*
Pit Roads and Ramps	.035	.024
Scramming	.000	.002
Conveyors Operating	.002	.059
Pumping and Drainage	.052	.026
General Open Pit Expense	.004	.014
Open Pit Superintendent	.013	.017
Stocking Lean Materials	.000	.001
Pit Cleanup	.002	.001
Exploratory Drilling	.000	.034
Loading Stockpile	.011	.031
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<u>Total Direct Ore,</u>	\$ .389	\$ .406



ATKINS MINE  
ANNUAL REPORT  
YEAR 1949

10. COST OF OPERATION:

a. Comparative Mining Cost Statement: (Cont'd)

	<u>1949 COST</u> <u>PER TON</u>	<u>1948 COST</u> <u>PER TON</u>
<u>General Mine Expenses:</u>		
Mining Engineering	\$ .005	\$ .008
Mech. & Elec. Engineering	.008	.006
Analysis and Grading	.029	.032
Safety Department	.004	.003
Special Expense	.002	.001
Ishpeming Office Expense	.003	.003
District Office Expense	.027	.018
Mine Office Expense	.026	.002
Insurance- Property, etc.	.014	.008
Personal Injury Expense	.002	.001
Social Security Taxes	.010	.010
Geological	.000	.001
Employees Vacation Pay	.007	.004
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<u>Total General Mine Expenses,</u>	\$ .137	\$ .116
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<u>COST OF PRODUCTION,</u>	\$ .526	\$ .523

b. Comparative Mining Cost:

The drop in open pit operating cost is accounted for by a \$.020 decrease in stockpile loading cost and a \$.034 per ton saving in exploratory drilling; of this \$.054 gain, an increased shovel, truck and drainage cost of \$.037 resulted in a net gain of \$.017 per ton. The General Mine Expenses increased \$.021 per ton. The Cost of Production of \$.526 per ton shows an increase of only \$.003 above that of 1948 which is very favorable and well below the estimate, accounted for, in part, by less production from the narrow West end than had been anticipated.

11. EXPLORATORY AND FUTURE EXPLORATION:

No exploratory drilling was done in 1949, nor is any future drilling anticipated at this property. The ore body was completely outlined in 1948.

12. TAXES:

The following is a statement of taxes at the Atkins Mine for the years 1949 and 1948:



ATKINS MINE  
ANNUAL REPORT  
YEAR 1949

12. TAXES:  
(Continued)

	1949	1948	<u>Increase</u>	<u>Decrease</u>
Atkins Mine,	\$ 8,727.02	\$ 13,532.76		\$4,805.74
Personal Property,	2,640.52 ✓	2,772.78		132.26
Total,	\$11,367.54 ✓	\$ 16,305.54 ✓		\$4,938.00
Average Tax Rate,	103.88	95.54	8.34	

The decrease in ad valorem taxes is due to the reduction in reserve tonnages by the amount of the ore shipments during the 1949 season.

The increased tax rate is largely due to the increased rate for school district.

13. ACCIDENTS AND  
PERSONAL INJURY:

Number of compensable accidents, -----	1
Compensable days lost, -----	200
Number of injuries, no lost time, -----	15

14. PROPOSED NEW  
CONSTRUCTION:

In 1950, no new construction is anticipated.

15. EQUIPMENT RECEIVED  
OR PROPOSED  
NEW EQUIPMENT:

In 1949, an 8" x 6" used pump was purchased and installed in the lower sump. A Ford 1-1/2-ton service truck was purchased and replaced the old truck.

Purchase of new equipment is not anticipated for 1950.

CANISTEO MINE  
ANNUAL REPORT  
YEAR 1949

1. GENERAL:

The regular winter stripping and washing plant repair program, which was underway at the end of 1948, was continued into 1949. The stripping program was continued on a 20-shift per week basis until completed on February 5th.

Repairs on pit operating equipment were carried forward on a five-day per week basis until April 11th, when pit clean-up operations were started, moving lean ore and waste material.

During this period, and previous to the ore season, the old stockpile was loaded out, the new grounds graded, necessary pipe line changes made, new steel loading bin erected and enough track laid to permit ore washing operations to start on May 2nd. The remaining stockpile tracks and the new stockpile stacker were completed in July.

Ore operations started on May 2nd, on a 2-shift 5-day per week basis, the night shift being devoted to cleaning up lean ore and other waste materials. Ore mining was stopped September 27th, to prepare for a strike called for October 1st, and which lasted until November 15th. A total of 1,108,338 tons of gross crude ore, including 63,665 tons of coarse rock rejects, was produced from four areas in two leases, mining separate leases with no commingling of crude ore. Two shovels and seven to eight trucks were used.

The washing plant received a total of 1,044,673 tons of crude ore, which produced 551,499 tons of concentrates for a shift average of 2,518 tons. Adding 13,573 tons of stockpile overrun, makes the season production 565,072 tons of concentrates.

On November 15th, after the strike, the usual winter repairs were started and continued to the end of the year. In addition, a major change of flowsheet, eliminating the two log washers in the plant and the building of a high density retreat plant, were started. At the end of the year, the plant changes were half completed and the machinery foundations in the retreat plant were poured.

Erection for dragline-conveyor stripping was completed and operations started on a single shift basis on June 6th. On June 20th, when four crews had been trained, operations were stepped up to a 20-shift per week schedule, continuing until stopped by the strike September 28th. A total of 495,078 cubic yards of stripping was removed.

From November 15th to the end of the year, the two-shovel stripping program was carried on, using eight to ten trucks and removing 335,309 cubic yards of stripping and paint rock.



CANISTEO MINE  
ANNUAL REPORT  
YEAR 1949

2. PRODUCTION,  
SHIPMENTS &  
INVENTORIES:

a. Production by Grades:

Snyder Crude, -----	241,776	tons
Bovey Crude, -----	802,897	"
 Total Crude Ore, -----	 1,044,673	 "
 Snyder Bessemer Concentrates, -----	 110,810	" 19.6%
Snyder Non-Bessemer Concentrates, -----	41,879	" 7.4
Bovey Bessemer Concentrates, -----	115,574	" 20.3
Bovey Non-Bessemer Concentrates, -----	296,809	" 51.5
 Total Production, -----	 565,072	 " 100.0%

b. Shipments:

Snyder Bessemer Concentrates, -----	110,810	"
Snyder Non-Bessemer Concentrates, -----	79,940	"
Bovey Bessemer Concentrates, -----	115,574	"
Bovey Non-Bessemer Concentrates, -----	278,158	"
 Total, -----	 584,482	 "

c. Stockpile Inventory:

Snyder Balance, -----	9,510	"
Bovey Balance, -----	18,651	"
 Total, -----	 28,161	 "

d. Production by Months - Crude Ore:

<u>MONTH</u>	<u>SNYDER</u>	<u>BOVEY</u>	<u>TOTAL</u>
May	40,278	148,229	188,507
June	10,494	210,757	221,251
July	27,790	154,045	181,835
August	89,692	154,203	243,895
September	73,522	135,663	209,185
 Total,	 241,776	 802,897	 1,044,673

e. Production by Months - Concents:

April,	13,573	-	13,573
May	22,383	74,104	96,487
June	5,173	104,321	109,494
July	16,938	79,221	96,159
August	50,904	84,942	135,846
September	43,718	69,795	113,513
 Total	 152,689	 412,383	 565,072



CANISTEO MINE  
ANNUAL REPORT  
YEAR 1949

2. PRODUCTION,  
SHIPMENTS &  
INVENTORIES:  
(Continued)

f. Ore Statement:

As of January 1, 1949, there was a total of 47,571 tons of Snyder concentrates in stockpile. The concentrate piles on the former stocking grounds were entirely cleaned up and shipped during April, with an overrun of 13,573 tons. This overrun was credited to the 1949 production. During the 1949 ore season a total of 31,109 tons was stocked in the new site, using the stacking system, and 2,948 tons were loaded out in September, just previous to the strike, leaving a balance of 28,161 tons in stock as of December 31st, 1949.

3. ANALYSIS:

a. Tonnage and Analyses of Crude Ore:

	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>
Snyder, -----	241,776	45.15	.048	29.93
Bovey, -----	802,897	41.94	.048	33.99
Total, -----	1,044,673	42.68	.048	33.05

b. Tonnage and Analyses of Concentrates - Production:

	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Mang.</u>	<u>Alu.</u>	<u>Moist.</u>	<u>Fe.Nat.</u>
Snyder Bess. Concs.	110,810	56.90	.036	11.79	.43	.43	7.37	52.71
Snyder N.B. Concs.	41,879	60.78	.073	8.18	.19	.44	5.96	57.16
Bovey Bess. Concs.	115,574	55.47	.035	13.47	.46	.65	8.65	50.67
Bovey N.B. Concs.	296,809	55.21	.069	13.40	.55	.52	7.78	50.92
Total,	565,072	56.01	.056	12.72	.49	.52	7.74	51.68

c. Tonnage & Analyses of Concentrates - Shipments:

Snyder Bess. Concs.	110,810	56.90	.036	11.79	.43	.43	7.37	52.71
Snyder N.B. Concs.	79,940	57.42	.056	11.31	.43	.44	7.24	53.26
Bovey Bess. Concs.	115,574	55.47	.035	13.47	.46	.65	8.65	50.67
Bovey N.B. Concs.	278,158	55.25	.067	13.37	.56	.53	7.79	50.95
Total,	584,482	55.90	.053	12.81	.50	.52	7.81	51.53

CANISTEO MINE  
ANNUAL REPORT  
YEAR 1949

3. ANALYSIS:  
(Continued)

d. Tonnage & Analyses of Ore in Stockpile:

	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Mang.</u>	<u>Alu.</u>	<u>Moist.</u>	<u>Fe. Nat.</u>
Snyder Conc.	9,510	59.99	.067	8.21	.34	.33	7.33	55.59
Bovey Conc.	18,651	54.69	.100	13.81	.45	.42	7.57	50.55
<b>Total,</b>	<b>28,161</b>	<b>56.48</b>	<b>.089</b>	<b>11.92</b>	<b>.41</b>	<b>.39</b>	<b>7.49</b>	<b>52.25</b>

e. Complete Analyses of Season's Shipments:

	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Mang.</u>	<u>Alu.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss</u>
Snyder Bess. Concs.	56.90	.036	11.79	.43	.43	.27	.18	.011	5.26
Snyder N.B. Conc.	57.42	.056	11.31	.43	.44	.27	.18	.010	4.95
Bovey Bess. Concs.	55.47	.035	13.47	.46	.65	.27	.19	.011	5.36
Bovey N.B. Concs.	55.25	.067	13.37	.56	.53	.26	.18	.011	5.70

4. ESTIMATE OF  
ORE RESERVES:

a. Developed Ore:  
Factors Used: (All Leases)

	<u>Cu. Ft.</u> <u>Per Ton</u>	<u>Rock</u> <u>Deduction</u>	<u>%</u> <u>Recovery</u>
Wash Ore,	14	-	60.66
Lean Wash Ore,	14		46.54
Low Grade Wash Ore,	14		58.62
Lean Low Grade Wash Ore,	14		48.81
Retreat Ore,	14		33.25



CANISTEO MINE  
ANNUAL REPORT  
YEAR 1949

4. ESTIMATE OF ORE RESERVES:  
(Continued)

a. Developed Ore: (continued)

	<u>RESERVE</u> <u>12-31-48</u>	<u>MINED</u> <u>1949</u>	<u>BALANCE</u> <u>AFTER</u> <u>MINING</u>	<u>CHANGED</u> <u>BY RE-</u> <u>ESTIMATE</u>	<u>RESERVE</u> <u>12-31-49</u>
<u>Bovey:</u>					
S $\frac{1}{2}$ -NE 30-56-24	160,282		160,282		160,282
NW-SE 30-56-24	382,137		382,137		382,137
NE-SE 30-56-24	747,869	206,956	540,913		540,913
NE-NE 31-56-24	1,296,541	205,427	1,091,114		1,091,114
NW-NW 32-56-24	278,389		278,389		278,389
Total Bovey	2,865,218	412,383	2,452,835		2,452,835 33.7
<u>Hemmens:</u>					
SW-SW 29-56-24	3,070,932		3,070,932		3,070,932 41.4
<u>Snyder:</u>					
SE-SW 30-56-24	1,259,696	87,842	1,171,854		1,171,854
SW-SE 30-56-24	308,834		308,834		308,834
SE-SE 30-56-24	470,147	64,847	405,300		405,300
Total Snyder	2,038,677	152,689	1,885,988		1,885,988 25.5
Grand Total	7,974,827	565,072	7,409,755	-	7,409,755

The reserve tonnage of 7,409,755, noted above, represents the reserve as of January 1, 1950, less the 1949 shipments. There is little likelihood of any large increase in these reserves during the next year or two, until some further improvements have been made in concentrating technique.

c. Estimated Analyses:

	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Mang.</u>	<u>Alu.</u>
<u>Bovey:</u>						
Bess. Wash Concs.	709,628	57.54	.037	10.09	.31	.48
Non-Bess. Wash Conc.	899,693	56.72	.030	10.23	.79	.46
Bess. Retreat Conc.	175,460	56.30	.040	12.00	.31	.48
Non-Bess. Ret. Conc.	668,054	55.50	.055	12.50	.36	.47
Total Bovey,	2,452,835	56.57	.060	10.93	.50	.47
<u>Hemmens:</u>						
Bess. Wash Conc.	1,197,233	57.70	.032	10.23	.30	.47
Non-Bess. Wash Conc.	982,026	57.08	.032	10.23	.30	.47
Bess. Ret. Conc.	338,800	56.30	.040	12.00	.30	.47
N.B. Retreat Conc.	552,873	55.50	.055	12.50	.41	.41
Total Hemmens,	3,070,932	56.95	.037	10.83	.32	.46



CANISTEO MINE  
ANNUAL REPORT  
YEAR 1949

4. ESTIMATE OF  
ORE RESERVES:  
(Continued)

c. Estimated Analyses: (Cont'd)

	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Mang.</u>	<u>Alu.</u>
<u>Snyder:</u>						
Bess. Wash Concs.	712,918	60.39	.037	8.94	.17	.28
Non-Bess. Wash Conc.	1,011,182	60.12	.064	8.27	.29	.36
Bess. Retreat Conc.	33,950	56.30	.040	12.00	.25	.41
N.B. Retreat Conc.	127,938	55.50	.055	12.50	.44	.49
Total Snyder,	1,885,988	59.84	.052	8.88	.25	.37
Total Bess. Wash Conc.	2,619,779	58.39	.033	9.84	.27	.42
Total N.B. Wash Conc.	2,892,901	58.03	.061	9.54	.45	.43
Wash Concentrates,	5,512,680	58.20	.048	9.68	.36	.43
Total Bess. Ret. Conc.	548,210	56.30	.040	12.00	.29	.47
Total N. B. Ret. Conc.	1,348,865	55.50	.055	12.50	.39	.45
Retreat Concs.	1,897,075	55.73	.051	12.36	.36	.46
Total Bess. Concs.	3,167,989	58.03	.034	10.21	.27	.43
Total N.B. Concs.	4,241,766	57.23	.059	10.48	.43	.44
Grand Total,	7,409,755	57.57	.048	10.36	.36	.44

5. LABOR & WAGES:

a. Comments:

The supply of labor was adequate throughout the year and good labor relations were maintained, despite the strike from September 30th to November 14th.

b. Comparative Statement of Wages & Product:

Product, -----	565,072 tons *
Number of Days Operated, -----	109
Number of Shifts Operated, -----	219
Average Daily Product, -----	5,160 tons
Average Product per Shift, -----	2,580 "
Average Number of Men Employed, -----	154
Product per Man per Day, -----	42.94
Average Wages per Day, -----	\$12.648
Total Amount Paid for Labor, -----	\$208,510.63
Labor Cost per Ton, -----	\$ 0.369

\* Includes overrun from 1948 stockpile of 13,573 tons.

CANISTEO MINE  
ANNUAL REPORT  
YEAR 1949

6. SURFACE:

a. Buildings, Repairs:

Ordinary maintenance work on all mine buildings was conducted during the year. The 40' x 60' steel building for truck service in the pit was equipped and after put into use, increased the efficiency in the truck servicing operations

House No. 6 was moved from the new stockpile grounds to a location near the office in connection with the arrangements for surface facilities at the mill.

b. Roads, Transmission Lines, etc:

There was no new road construction in the area during the year.

The main transformer station was moved from the site on the new stockpile grounds to a new location north of the washing plant. This necessitated shifting the 22,000-volt main transmission feed line.

c. Miscellaneous General Construction:

The construction of the stripping conveyor system, which was started last year, was finished in May.

Construction made necessary by the establishment of new stockpile grounds, including new pipe lines, a new transformer station, re-location and laying of loading tracks and a new loading-pocket, were all completed in July.

At the end of the year, extensive washing plant changes, the speeding up of the pit conveyor system, and the construction of a high density plant, were well started. The washing plant changes will be completed May 1st and the retreat plant should be ready for operation by the early part of June.

7. OPEN PIT:

a. Stripping:

The stripping program, which was in progress at the close of 1948, was carried forward into the new year until February 5th, when operations were discontinued due to cold weather. This consisted of removing paint rock and lean waste material from the layer overlying the bottom wash ores in the South Bovey and the East Hemmens pit bottom, and stripping surface material to uncover some high grade wash ore in the Snyder lease in the extreme West end of the pit. The operation in the pit bottom was completed with one shovel and four or five trucks, the material being hauled to a paint rock dump in the pit. In the West end stripping, the material was dug with the 7-yard dragline in a 60' cut to the top of ore, cast into piles and re-loaded with a shovel and hauled to a waste dump, west of the property.



CANISTEO MINE  
ANNUAL REPORT  
YEAR 1949

7. OPEN PIT:  
(Continued)

a. Stripping: (continued)

Both jobs were conducted on a 20-shift per week basis, the men receiving 40 hours per week. Progress in the pit bottom was slow, due to wet conditions and extremely cold weather. The latter likewise hampered the work in the West Snyder. A total of 228,164 cubic yards was stripped during this period at an average cost of \$.34 per cubic yard, which was satisfactory considering the difficult working conditions.

A new stripping program was started in April, 1949, which contemplated the stripping of 665,000 cubic yards of shovel and truck stripping and 900,000 cubic yards of stripping with dragline and conveyor system.

The truck and shovel stripping program of 665,000 yards consisted of 165,000 cubic yards of paint rock and other waste and lean materials in the mining areas within the pit and 500,000 cubic yards of surface and waste material from the so-called Snyder Point on the north side of the Mid-Snyder forty and the south side of the West Snyder forty, immediately south of the washing plant. The operations were started on April 11th on the basis of three shifts per day, five days per week until the start of the ore season, and it was then continued intermittently throughout the ore season until the strike at the end of September. The program was again started on November 15th on a 20-shift per week basis, using one shovel and four to five trucks in the lean ore stripping in the pit bottom and the pit mining areas, and a second large shovel and five to six trucks in the surface stripping operations near the washing plant. After the completion of the work in the pit bottom, additional equipment was shifted to the Snyder Point where two shovels and as many trucks as were available, were used to speed up the program. From April 11th until the end of the year, a total of 508,735 cubic yards of truck and shovel stripping was completed at an average cost of \$.306 per cubic yard. The work in the spring and that conducted intermittently during the summer months, showed excellent costs of from \$.23 to \$.26 per cubic yard. However, the winter stripping in December increased considerably and showed a cost of \$.389 per cubic yard. The cost secured was well within the budget estimate.

After the erection of the stripping conveyor system was completed, a single-shift stripping operation was started on June 6th. This was stepped up to a 3-shift operation and again to a 20-shift per week operation as crews were broken in to handle the dragline equipment. From June 20th until the strike on September 28th, the dragline and conveyor stripping operations were conducted on a 20-shift per week basis and a total of 495,078 cubic yards was



CANISTEO MINE  
ANNUAL REPORT  
YEAR 1949

7. OPEN PIT:  
(Continued)

a. Stripping: (continued)

moved at an average rate of 1,827 cubic yards per shift.

The operation was rather slow at the start, due to the fact that men had to be trained for the new type work and to the fact that there was some difficulty in handling sticky, soft clay in the pit screening plant. These difficulties were ironed out as the season progressed and towards the end of the summer, production on a 3-shift per day basis was increased to as high as 7,000 cubic yards.

In addition to the difficulties experienced at the pit, there were some delays at the dump site, due to sloughing of the dumps in a muskeg area, which resulted in the necessity of using an extra tractor at the disposal site.

It was found, during the summer, that the propelling mechanism on the pit screening plant was not sufficient for slight grades and steps have been taken to correct this feature. There will likewise be some further improvements in the screen mechanism and the shuttle conveyor at the screening plant.

Owing to the fact that the strike was not settled until November 14th, cold weather prevented the resumption of conveyor and dragline stripping operations during the balance of the year. The 495,078 cubic yards were moved at an average cost of approximately \$.240. This was slightly higher than had been estimated for this work. However, it is felt that the balance of the work in the East end of the pit should be conducted for \$.20 or less per cubic yard.

b. Open Pit Mining:

The 1949 ore season was started on May 2nd on a 2-shift 5-day per week basis, working the sixth day when required. The operations were suspended on September 27th in preparation for the threatened steel strike. The pit was operated a total of 219 shifts and produced 1,108,338 gross tons of crude ore from which 63,665 tons of coarse rejects were scalped at the pit screening plant, leaving 1,044,673 tons of crude ore which was sent to the washing plant. The average production per shift of gross crude amounted to 5,061 tons and net crude - 4,770 tons. The mining cost per ton of crude ore was \$.276, as compared with a budget estimate of \$.270 and a cost of \$.251 in 1948.

Ore was mined from three areas, the West Snyder - at the extreme West end of the pit; the East Bovey, from the East side of the North Bovey forty and from the South side of the pit in the South

CANISTEO MINE  
ANNUAL REPORT  
YEAR 1949

7. OPEN PIT:  
(Continued)

b. Open Pit Mining: (continued)

Bovey and Snyder leases. The West Snyder produced a high grade wash ore which was mined sparingly and used only when necessary for up-grading. The East Bovey, which produced approximately 37% of the 1949 production, was mainly poor wash ore, containing a high percentage of rock and layers of poor quality material which had to be either absorbed or wasted. This area can be more effectively mined after the retreat, or high density plant has been constructed. The area from the south side of the pit produced 48% of the production and the ore lying in the bottom wash horizon under the paint rock. Mining in this area entailed moving considerable paint rock and lean ore during the process of mining in a very wet bottom. In view of the fact that approximately half of the production came from this soft and wet area, the haulage costs were rather high during the season. The West Snyder produced 156,547 tons of crude ore; the East Bovey 429,589 tons and the South side of the pit, 522,202 tons, or a total of 1,108,338 tons. Of this total, 855,284 tons were taken from the Bovey lease and 253,054 tons from the Snyder.

In addition to the actual mining, a total of 420,283 tons of lean ore and other waste materials, which were encountered in mining, were loaded and disposed of at the proper dump. This represented a cost of \$.021 per ton of shipping grade ore produced. The work was conducted, mainly, on the night shift in connection with stripping operations.

c. Pumping and Drainage:

Aside from the necessity of operating in the wet pit bottom on the south side of the pit, there were no new pumping developments during the year. During the 1950 season it will be necessary to completely mine out the pit bottom in the southwest corner of the South Bovey lease, so that this area, which is the deepest part of the pit, can be used for the main sump after the 1950 season.

8. BENEFICIATION:

The washing plant was operated on the same schedule as the open pit mining and a total of 1,044,673 tons of crude ore was handled to produce 551,499 tons of concentrates. The average output per shift amounted to 2,518 tons, with a weight recovery of 52.79%.

There were no major changes in the flowsheet during the year, but the operations during 1949 clearly demonstrated that it will be necessary to operate a high density, or retreat plant in connection with the washing plant after 1949, in order to properly handle the greater part of the poorer ores in the Canisteo Mine.



CANISTEO MINE  
ANNUAL REPORT  
YEAR 1949

8. BENEFICIATION:  
(Continued)

It was also developed that it will be necessary to increase the speed and the power on the three motors and drives used on the main conveying system from the pit to the plant. This will not only increase the production in the plant, but it will avoid delays through slippage from under-powered motors.

In connection with the completing of a retreat plant for the 1950 ore season, the changes in the washing plant proper will include elimination of the log washers and the 4' x 6' dewatering screens and their replacement with two 6' x 16' double-deck wash screens. The product from these screens will either go to the concentrate bin in the case of wash ore, or to the retreat surge pile in the case of retreat, or jig ore. In addition, the classifiers are being rearranged so that double-classification can be used for the minus 1/8" material in order to effect a better concentration of the finer size material.

The new stocking grounds and the belt stacker were completed during the early part of the summer and were in use throughout the latter part of the season. It will be necessary to install larger motors in the stacker proper and in the swing mechanism of the stacker in order to increase the production.

During the season, at times of car shortages, it was necessary to stock 31,109 tons of concentrates. From this amount, 2,948 tons were loaded out in September, just previous to the strike, leaving a balance of 28,161 tons at the end of the year. The old stockpile grounds were completely cleaned up and shipped early in the spring and yielded an overrun of 13,573 tons which was credited to the 1949 production.

The delays at the washing plant during the 1949 season amounted to 237.71 hours, or a total of 13.38% of the total working hours. A classification of the delays and the percent of total working hours is listed below:

	<u>Total Hours</u>	<u>% of Total Working Hours</u>
Pit Delays - No Crude Ore	34.40	1.93%
Delays due to Wash Plant Equipment	43.05	2.43
Electrical Delays	8.50	.48
Pump and Pipeline Delays	.83	.05
Transportation & Conveying Delays	56.06	3.16
Delays for Lack of Railroad Cars	64.46	3.62
Delays for Stockpiling	<u>30.41</u>	<u>1.71</u>
Total,	237.71	13.38%



CANISTEO MINE  
ANNUAL REPORT  
YEAR 1949

8. BENEFICIATION:  
(Continued)

The tonnage and analyses of the plant rejects were as follows:

5' x 14' Screen Rejects

<u>Lease</u>	<u>Tons</u>	<u>Iron</u>	<u>Silica</u>
Snyder,	11,278	37.19	40.22
Bovey,	52,387	36.17	41.14
Total,	66,665	36.35	40.98

36" Belt Rejects

Snyder,	2,163	38.10	39.57
Bovey,	20,166	36.51	40.27
Total,	22,329	36.64	40.20

The concentration data for the year was as follows:

	<u>Tons</u>	<u>Percent of Total Mined</u>	<u>Percent of Iron Dried</u>	<u>Recoveries Tonnage</u>	<u>Iron Unit</u>
Material removed in Mining	1,289,514	100.00	41.48		
Less: Lean Ore in Stockpile	161,876	12.55	37.26		
	1,127,638	87.45	42.08		
Less: Pit rock wasted,	19,300	1.50	28.66		
Total Transported to Mill,	1,108,338	85.95	42.32		
Less: Rock Rejects in Screen. Plant	63,665	4.94	36.35		
Crude Ore Entering Mill,	1,044,673	81.01	42.68		
Concentrates Produced	565,071	43.82	56.01	54.09	70.98
Rock Rejects on Mill Picking Belt	22,329	1.73	36.64		
Tailings (by deduct- ion)	457,273	35.46	26.50		

CANISTEO MINE  
ANNUAL REPORT  
YEAR 1949

9. MAINTENANCE  
AND REPAIR:

The winter repair program at the shops and concentrating plants was carried forward from the first of the year until the start of mining operations in early May, and all pit and mining equipment were given complete repairs where necessary. The repair program at the plant was again resumed after the settlement of the strike on November 14th and carried forward until the end of the year.

10. COST OF  
OPERATION:

a. Comparative Mining Costs:

	<u>BUDGET</u> <u>ESTIMATE</u>	<u>COST PER</u> <u>TON 1949</u>	<u>COST PER</u> <u>TON 1948</u>
Product,	625,000	565,072	908,833
Average Tons per Shift		2,580	2,553
Tons per Man per Day		42.94	41.35
Number of Shifts Operated		109	139
<u>COST:</u>			
Open Pit Mining	\$ .270	\$ .276	\$ .251
Concentrating	.114	.112	.145
Stocking & Loading Concentrates	.020	.012	.009
General Mine Expense	.176	.195	.105
Idle and Winter Expense	.243	.430	.213
<u>Cost of Production,</u>	<u>\$1.068</u>	<u>\$ 1.291</u>	<u>\$ .882</u>
Amortization of Leasehold		.147	.123
Depreciation- Plant & Equipment		.031	.063
Depreciation- Motorized Equipment		.055	.089
Depreciation- Movable Equipment		.006	.000
Amortization of Stripping		.515	.386
Taxes - Ad Valorem		.247	.143
Occupational		.159	.145
Royalty		.045	.037
<u>Total Cost at Mine,</u>		<u>\$ 2.498</u>	<u>\$ 1.868</u>
Miscellaneous Expense & Income		.013	.000
<u>Grand Total,</u>		<u>\$ 2.483</u>	<u>\$ 1.868</u>



CANISTEO MINE  
ANNUAL REPORT  
YEAR 1949

10. COST OF  
OPERATION:  
(Continued)

d. Detailed Cost Comparison:

(1) Product:

There is very little basis of comparison between the 1948 and 1949 operations, due to the fact that in 1948 a total of 908,833 tons of concentrates was produced, with a production of 565,072 tons in 1949.

(2) Open Pit Mining:

Open pit mining in 1949 showed a net cost of \$.276 per ton as compared with a budget estimate of \$.270 and a cost of \$.251 realized in 1948, in view of the fact that this was favorable in consideration of the smaller tonnage produced in 1949.

(3) Concentrating:

The concentrating cost of \$.112 per ton is approximately \$.003 under the cost realized in 1948 and slightly under the budget.

(4) Stocking & Loading Concentrates:

The increase of approximately \$.003 over the 1948 cost was the result of entirely cleaning up the old stocking grounds.

(5) General Mine Expense:

The general mine expense in 1949 showed an increase of \$.090 from that secured in 1948 and an increase of approximately \$.020 over and above the budget estimate. This was due to a decreased tonnage as result of the strike, the higher cost in District Office and Mine Office Expense and in Mechanical & Mining Engineering. There was also some increase in Geological and Metallurgical Expense.

(6) Idle & Winter Expense:

The Idle and Winter Expense in 1949 amounted to \$.430 per ton as compared with \$.213 in 1948 and a budget estimate of \$.243. The large increase was the result of a more extensive repair program during the early winter of 1949 and the period immediately following the strike; a large strike expense - which was credited to winter and idle, and to some improvements and replacements in the washing plant equipment during the season, all of which were chargeable to winter and idle.

CANISTEO MINE  
ANNUAL REPORT  
YEAR 1949

11. EXPLORATION  
AND FUTURE  
EXPLORATION:

A total of 2,983 feet was drilled in 1949 by use of the Company drills and contract drilling. Of this total, 444 feet was sample drilling and 2,539 feet was exploratory drilling. Six sample holes were drilled in the South Bovey and two in the East Bovey mining areas. The exploratory drilling was done in two future mining areas and three dump areas. The mining areas drilled were the Bovey (NW-SE-30) and Snyder (NE-SW-30), where the drilling is outlining the northward extension of the ore on the west side of the mine; and the Hemmens (SW-SW-29) on the east side, which is being opened by dragline-conveyor stripping. In each of two dump areas, one hole has proven the barren character of the property; and in the third dump area, four holes have been drilled in determining the westward extension into the Bovey #2 lease, of a small stringer of ore from the Walker Mine to determine our dump limits.

Twenty-four holes were drilled during the year, eight by contract drilling, a total of 1,408 feet; and sixteen holes by Company drilling, totaling 1,575 feet. There were two Company drills, both starting during the year with new crews and we are trying to up-grade these crews on ability rather than total seniority, as requested by the Union.

Under future exploration, the present program anticipates drilling eight more holes in the West Snyder, three more sample holes in the South Bovey and at least two in the Hemmens lease, the area being stripped by dragline-conveyor.

12. TAXES:

The following Statement shows the Canisteco Mine taxes and the average annual rates for 1949 and 1948:

	<u>1949</u>	<u>1948</u>	<u>Increase</u>	<u>Decrease</u>
Canisteco Mine,	\$125,722.96	\$120,931.57	\$4,791.39	
Washing Plant & Aux.Lands,	1,200.64	1,072.32	128.32	
Personal Property,	<u>12,632.91</u>	<u>7,927.70</u>	<u>4,705.21</u>	
<b>Total,</b>	<b>\$139,556.51</b>	<b>\$129,931.59</b>	<b>\$9,624.92</b>	
Village Lots,	<u>\$ 237.80</u>	<u>\$ 208.74</u>	<u>\$ 29.06</u>	
<b>Grand Total,</b>	<b>\$139,794.31</b>	<b>\$130,140.33</b>	<b>\$9,653.98</b>	
Average Tax Rate,	134.58	117.87	16.71	



CANISTEO MINE  
ANNUAL REPORT  
YEAR 1949

12. TAXES:  
(Continued)

The increase in ad valorem taxes is due to a change in classification of some of the reserve tonnage and to the increased tax rate.

The increase for Washing Plant and Auxiliary Lands is due to the increased tax rate.

The increase in Personal Property tax is accounted for by the addition of equipment.

The increased tax rate is largely due to increases in the County and School District rates.

13. ACCIDENTS AND  
PERSONAL INJURY:

There were four lost-time accidents sustained at the Canisteo Mine during the year, and these are described as follows:

Name: Henry Wesa January 4th.  
Cause: Wesa was moving an overhead crane in the shop. The chain caught on a Euclid truck radiator, which was on its side (narrow edge) on the floor. Radiator fell on Wesa's right foot, breaking second metatarsal.  
Time Lost: 58 Days  
Compensation Paid: \$ 261.00

Name: Andrew Columbo February 8th.  
Cause: While unloading acetylene tanks from pick-up truck, Columbo twisted knee of his left leg.  
Time Lost: 10-1/2 Days.  
Compensation Paid: \$ 61.63

Name: Herbert Mann September 9th.  
Cause: While Mann was cleaning rock out of screen at stripping conveyor, he slipped and fell on screen bars, falling on his left side, causing contusion of lateral left hip and lower lateral left ribs.  
Time Lost: 109 Days.  
Compensation Paid: \$ 545.00

Name: Robert Crisp August 16th.  
Cause: Crisp stepped off tractor and hurt his knee.  
Time Lost: Liability denied.  
Compensation Paid: None.

CANISTEO MINE  
ANNUAL REPORT  
YEAR 1949

14. PROPOSED NEW  
CONSTRUCTION:

The proposed new construction at the Canisteco Mine consists in the completion of the high density plant which is now underway and will be ready for the 1950 ore season.

15. EQUIPMENT RECEIVED  
AND PROPOSED  
NEW EQUIPMENT:

New equipment received during 1949 consisted of:

- 4 - Pickup Trucks
- 1 - Stacking Conveyor
- 2 - 22-ton Euclid rear-dump trucks
- 1 - HD-19 Tractor and dozer

Proposed New Equipment in 1950

- 2 - 22-ton Euclid rear-dump trucks
- 1 - TD-24 International Tractor and dozer
- 1 - Single-unit high density plant
  - The necessary motors to speed up the two lower flights of the main pit conveyor - and
- 1 - Lull Loader with 1/2-yard Scoop, or bucket.

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HAWKINS MINE  
ANNUAL REPORT  
YEAR 1949

1. GENERAL:

Stripping operations and repair work that were in effect at the close of 1948, were continued into 1949. The stripping was conducted on a 20-shift per week basis until February 26th, when the operations were suspended to avoid further high winter stripping costs.

The winter repair work at the shop was carried forward on a 5-day per week basis. The necessary repairs were given to the shovels, drills, trucks, tractors, dump cars and other pit equipment. Repairs were also made on the equipment in the pit screening plant and the conveyor system, with the work completed and ready for the start of the ore season on May 9th. The necessary shop repairs on all washing plant equipment and on the underground mining equipment, were likewise completed.

At the concentrating plant, the winter work was discontinued on February 15th, 1949 and resumed again on March 21st, and the entire program was completed, ready for the start of the ore season.

During the latter part of March and the month of April, 74,470 tons of stockpile concentrates were loaded and shipped.

The 1949 ore season was started on May 2nd on a 2-shift 5-day per week basis. A total of 1,095,898 gross tons of crude ore, including scalped coarse rejects, was produced, using two 85-B shovels and six 20-ton trucks. The 54 Diesel shovel was used as a standby and for clean-up operations.

The washing plant received 1,039,164 net tons of crude ore after the removal of 56,734 tons of coarse screen rejects, and produced 604,928 tons of concentrates.

Due to car shortages it was necessary to stock 78,318 tons of concentrates during the shipping season, and of this amount, 48,498 tons were loaded out intermittently throughout the season as extra production was necessary, leaving 29,820 tons in stock.

During the latter part of July and the month of September, some stripping operations were conducted concurrently with the mining.

The 1949 ore season closed on September 29th, in preparation for the impending steel strike. The concentrating plant was washed down on September 30th. While awaiting definite announcement on the steel strike, the pit crews were engaged in stripping operations to avoid any question of unemployment insurance.

HAWKINS MINE  
ANNUAL REPORT  
YEAR 1949

1. GENERAL:  
(Continued)

The extensive exploratory drilling program was continued during the year, with two contract drillers and a Company drill. The drilling program in general has shown some additional wash and retreat ores and is being continued in 1950 in order to furnish sufficient information for a comprehensive review of the property.

2. PRODUCTION,  
SHIPMENTS &  
INVENTORIES:

a. Production by Grades - Crude Ore:

Hawkins Crude, -----	1,039,164 tons
Hawkins Bessemer Coarse Concs. ....	167,242 "
Hawkins Non-Bess. Coarse Concs. -----	340,855 "
Hawkins Non-Bess. Fines, -----	<u>96,831 "</u>
Total Production, -----	604,928 "

b. Shipments:

Hawkins Bess. Coarse Concs. -----	167,242 "
Hawkins Non-Bess. Coarse Concs. -----	415,946 "
Hawkins Non-Bess. Fines, -----	<u>88,835 "</u>
Total Shipments, -----	672,023 "

c. Stockpile Inventories:

Hawkins Coarse Concs. -----	12,210 "
Hawkins Fines, -----	<u>19,569 "</u>
Total, -----	31,779 "

d. Production by Months - Crude Ore:

May, -----	205,472 "
June, -----	232,765 "
July, -----	202,903 "
August, -----	182,534 "
September, -----	<u>215,490 "</u>
Total, -----	1,039,164 "

e. Production by Months - Concentrates:

	HAWKINS <u>COARSE</u>	HAWKINS <u>FINES</u>	<u>TOTAL</u>
May, -----	121,346	6,506	127,852
June, -----	112,420	26,558	138,978
July, -----	89,818	25,320	115,138
August, -----	78,841	25,338	104,179
September, -----	<u>105,672</u>	<u>13,109</u>	<u>118,781</u>
Total, -----	508,097	96,831	604,928



HAWKINS MINE  
ANNUAL REPORT  
YEAR 1949

2. PRODUCTION,  
SHIPMENTS &  
INVENTORIES:  
(Continued)

f. Ore Statement:

As of January 1, 1949, there was in stock at the Hawkins concentrator a total of 98,874 tons, of which 87,301 tons were coarse concentrates and 11,573 tons fines. As of January 1, 1950, there was a total in stock of 31,779 tons of concentrates, of which 12,210 tons were coarse concentrates and 19,569 tons fines. The 19,569 tons of fines included a carry-over of 1,959 tons from the former stockpile.

3. ANALYSIS:

a. Tonnage & Analysis of Crude Ore Produced:

	Tons	Iron	Phos.	Sil.	Mang.	Alum.	Moist.	Fe.Nat.
Hawkins,	1,039,164	44.46	.035	31.74				

b. Tonnage & Analysis of Concentrates Produced:

Hawkins Bess.								
Coarse Con.	167,242	57.76	.039	11.78	.48	.58	7.35	53.52
Hawkins N.B.								
Coarse Conc.	340,855	58.03	.048	11.17	.88	.68	7.50	53.68
Hawkins N.B.								
Fines	96,831	55.60	.034	16.19	.50	.65	8.60	50.82
Total,	604,928	57.56	.043	12.14	.71	.65	7.63	53.17

c. Tonnage & Analysis of Concentrates Shipped:

Hawkins Bess.								
Coarse Conc.	167,242	57.76	.039	11.78	.48	.58	7.35	53.52
Hawkins N.B.								
Coarse Conc.	415,946	57.70	.046	11.41	.83	.65	7.32	53.48
Hawkins N.B.								
Fines	88,835	55.69	.034	16.08	.51	.65	8.69	50.85
Total,	672,023	57.45	.042	12.12	.70	.64	7.51	53.14

d. Tonnage & Analysis of Ore in Stockpile:

Hawkins Conc.	12,210	58.34	.044	11.12	.68	.64	7.39	54.03
Hawkins fines	19,569	55.27	.034	16.33	.49	.58	8.19	50.74

e. Complete Analysis of Shipments:

	Iron	Phos.	Silica	Mang.	Alu.	Lime	Mag.	Sul.	Loss
Hawkins Bess.									
Coarse,	57.76	.039	11.78	.48	.58	.27	.20	.011	3.80
Hawkins N.B.									
Coarse,	57.70	.046	11.41	.83	.65	.28	.20	.012	3.65
Hawkins N.B.									
Fines,	55.69	.034	16.08	.51	.65	.28	.19	.011	2.35

HAWKINS MINE  
ANNUAL REPORT  
YEAR 1949

4. ESTIMATE OF  
ORE RESERVES:

a. Developed Ore:  
Factors Used:

	Cu. Ft. Per Ton	Rock Deduction	% Recovery
Wash Ore	14	-	60.00
Lean Wash Ore	14		38.00
Low Grade Wash Ore	14		54.00
Lean Low Grade Wash Ore	14		40.00
Retreat Ore	14		40.00

	Reserve 12-31-48	Mined 1949	Bal. After Mining	Changed by Re-Est.	Reserve 12-31-49
<u>SW-NW 32</u>					
Wash Conc. O.P.	428,067	79,600	348,467	+ 672,589	1,021,056
Ret. Conc. O.P.				+ 698,844	698,844
Total,	428,067	79,600	348,467	+1,371,433	1,719,900
<u>NW-SW 32</u>					
Wash Conc. O.P.	30		30	+ 245,350	245,380
Ret. Conc. O.P.				+ 89,420	89,420
Wash Conc. U.G.	877,834		877,834	- 716,832	161,002
Total,	877,864		877,864	- 382,062	495,802
<u>NE-SE 31</u>					
Wash Conc. O.P.	582,417	78,000	504,417	+ 359,216	863,633
Ret. Conc. O.P.				+ 822,967	822,967
Wash Conc. U.G.	1,239,264	-	1,239,264	-1,239,264	--
Total,	1,821,681	78,000	1,743,681	- 57,081	1,686,600
<u>SE-NE 31</u>					
Wash Conc. O.P.	170,559	447,328	-	+ 817,535	540,766
Ret. Conc.				+ 217,934	217,934
Total,	170,559	447,328		+1,035,469	758,700
Grand Total,	3,298,171	604,928	2,693,243	+1,967,759	4,661,002

b. Prospective Ore:

The estimated 4,661,002 tons shows an increase of approximately 2,000,000 tons of ore over and above the old Harvester estimates. Part of this tonnage was developed by drilling and part by re-classification. In addition to the above increase, there will be another large increase developed during 1950 by the extensive drilling program and by a re-classification of the ores from the former Harvester estimates.



HAWKINS MINE  
ANNUAL REPORT  
YEAR 1949

4. ESTIMATE OF  
ORE RESERVES:

c. Estimated Analyses of Ore Reserves:

	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>
<u>Hawkins:</u>				
Bess. Wash Conc. O.P.	1,651,696	58.39	.031	9.59
Non-Bess. Wash Conc. O.P.	1,019,139	58.46	.055	9.64
Bess. Retreat Conc.	1,293,554	57.16	.032	11.41
Non-Bess. Retreat Conc.	535,611	57.51	.052	11.42
Bess. Wash Conc. U.G.	161,002	58.23	.032	8.67
<b>Total,</b>	<b>4,661,002</b>	<b>57.96</b>	<b>.039</b>	<b>10.28</b>
Bess. Wash Conc. O.P.	1,651,696	58.39	.031	9.59
Bess. Wash Conc. U.G.	161,002	58.23	.032	8.67
Non-Bess. Wash Conc. O.P.	1,019,139	58.46	.055	9.64
<b>Total Wash Conc.</b>	<b>2,831,837</b>	<b>58.41</b>	<b>.040</b>	<b>9.56</b>
Bess. Retreat Conc.	1,293,554	57.16	.032	11.41
Non-Bess. Retreat Conc.	535,611	57.51	.052	11.42
<b>Total Retreat Conc.</b>	<b>1,829,165</b>	<b>57.26</b>	<b>.038</b>	<b>11.41</b>
<b>Total Bess. Conc.</b>	<b>3,106,252</b>	<b>57.87</b>	<b>.032</b>	<b>10.30</b>
<b>Total Non-Bess. Conc.</b>	<b>1,554,750</b>	<b>58.13</b>	<b>.054</b>	<b>10.25</b>
<b>Total,</b>	<b>4,661,002</b>	<b>57.96</b>	<b>.039</b>	<b>10.28</b>

5. LABOR & WAGES:

a. Comments:

There was an ample supply of labor throughout the Range during the year and, on this account, there was some improvement in labor in general. Labor relations were very good throughout the year, despite the steel strike which was called on September 30th.

b. Comparative Statement of Wages & Product:

Product -----	604,928 tons
Number of Days Operated, -----	100
Number of Shifts Operated, -----	200
Average Daily Product, -----	6,049
Average Product per Shift, -----	3,025
Average Number of Men Working, -----	143-1/2
Average Wages per Hour (Ore Season) -----	\$1.510
Amount Paid for Labor " " -----	\$192,442.89
Labor Cost per Ton, -----	\$0.318

HAWKINS MINE  
ANNUAL REPORT  
YEAR 1949

6. SURFACE:

a. Buildings, Repairs:

It was necessary to make some extensive repairs to the dwellings at the Hawkins Location in view of the fact that they had been allowed to run down in the former years. Aside from the ordinary maintenance work on the office and mine buildings, there were no major construction projects. The change-house at the concentrating plant was completed and ready for occupancy in the early part of the year.

b. Roads, Transmission Lines and Tracks:

Bottlenecks and poor grades in the former roads were eliminated by a new program where necessary, in both the ore and stripping operations. A re-arrangement of the power line from the shops to the ore pocket was made. The main incoming switch at the washing plant was replaced and the power line to the lake pumps was repaired.

A small amount of the former railroad tracks were removed during the year in the area of the concentrating plant.

7. OPEN PIT:

a. Stripping:

The stripping program, which had been started in November, 1948 under E&A #CC-272, was carried over in 1949 and continued until February 6th, when operations were suspended to avoid excessive winter stripping costs. The program consisted, mainly, of stripping blocky paintrock, taconite and waste ore material from the northeast portion of the pit to release underlying wash ores.

The operation was conducted on a 20-shift per week basis, with four complete crews, the men getting 40 hours per week. One 3-1/2-yard shovel and six to seven 22-ton trucks were used and the material was hauled to the main stripping dumps, south of the pit and near the washing plant.

Stripping in the same area was again resumed on April 12th, and continued on a 2-shift 5-day per week basis until the start of ore operations on April 30th.

From January 1st to April 30th, a total of 176,378 cubic yards was removed at an average cost of \$.493 per cubic yard. Slow loading with a small shovel, winter work and a long haul accounted for the increased cost over and above the budget estimate of \$.413 per cubic yard. The original budget was based on using dumps immediately north of the pit, with a very short haul, and did not include the cost of the long haul, south of the Great Northern Railway and the main yard.



HAWKINS MINE  
ANNUAL REPORT  
YEAR 1949

7. OPEN PIT:  
(Cont'd)

a. Stripping: (cont'd)

During the latter part of July and the month of August, the pit operations were stepped up to 3-shifts per day 5-days per week to allow six shifts of stripping each week, to run concurrently with the mining operations. During this period, 37,646 cubic yards of blocky paintrock, taconite and waste ore material were removed at an average cost of \$0.403 per cubic yard, which was well under the budget estimate.

On November 14th, following the settlement of the steel strike, a new stripping program was started, extending the paintrock and taconite stripping to the north and east in the northeast part of the pit. In order to obtain better costs, two 3-1/2-yard electric shovels and eight to ten 22-ton trucks were operated on a 20-shift per week basis. During the last half of November and the month of December, 210,293 cubic yards of taconite and blocky paintrock were removed at an average cost of \$.423 per cubic yard, which was quite favorable as compared with the budget estimate of \$.413, in view of the fact that the material was all blocky paintrock and taconite.

The following tabulation shows the stripping removed during the year:

Lean Ore and Waste Material,	3,556 cu. yds.
Paint Rock	305,362 "
Taconite	<u>115,401</u> "
Total,	424,319 "

b. Open Pit Mining:

Ore operations at the Hawkins Mine were started on May 2nd on a two 8-hr. shift per day, 5-days per week basis and the operations were continued until September 27th when it was necessary to suspend the same in preparation for strike. The mining in the pit was conducted for a total of 200 shifts and produced 1,095,898 gross tons of crude ore. From this, 56,734 tons of coarse rejects were scalped at the pit screening plant and stocked in the pit. The net crude to the washing plant amounted to 1,039,164 tons. The average output per shift amounted to 5,479 tons of gross crude and 5,195 tons of net crude. The average weight recovery from the crude ore during the season was 55.2%.

The mining was conducted with two shovels and six 22-ton Euclid trucks, the ore being mined from various areas and mixed to effect the proper grading. Mining was conducted in the upper benches in the northwest corner of the pit, close to the York and Hoadley

HAWKINS MINE  
ANNUAL REPORT  
YEAR 1949

7. OPEN PIT:  
(Cont'd)

b. Open Pit Mining: (Cont'd)

lines, in the lower benches in the north and west sides of the pit and from the bottom of the pit, near the water level. The leaner ores from the upper benches were mixed with the higher grade material in the lower horizon. The 2-1/2-yard 54-B Diesel shovel, which had been recently purchased, was used to good advantage in clean-up operations in the outerlying areas. Mining conditions throughout the season were good.

In addition to the crude ore mined, a total of 24,925 tons of lean and waste material was handled. This consisted of 16,604 tons of pit rock; 599.99 tons of paintrock and 7,722 tons of lean waste material. These were placed on the proper dump. This represents a cost of approximately \$.010 per ton for each ton of concentrates produced.

There were no pumping or drainage problems during the year, but it will be necessary to make some rather extensive repairs in the drainage shaft and drifts for the 1950 ore season.

8. BENEFICIATION:

Washing plant operations were conducted on the same general basis as the open pit mining and a total of 604,928 tons of concentrates was produced in the treatment of 1,039,164 tons of crude ore at the mill. The average production per shift amounted to 3,024 tons of concentrates, with a weight recovery of 55.20%. In general, the concentrating plant operations were the same as 1948 and were very satisfactory. There were no serious delays during the season and a steady production was maintained at all times.

Due to a shortage of Great Northern ore cars it was necessary to stockpile a total of 78,318 tons of concentrates during the shipping season. Of this amount, 48,498 tons were loaded out and shipped, leaving a balance of 29,820 tons in stock from the 1949 production. This, added to a carry-over of 1,959 tons from the 1948 production, left a balance in stock, as of December 31, 1949, of 31,779 tons. This consisted of 19,569 tons of fine concentrates and 12,210 tons of regular concentrates. It was necessary to enlarge the stocking area served by the conveyor stacking system, immediately west of the plant, so that a larger tonnage could be handled by this means.

Following is a summary of the plant operations for the 1949 season as prepared by the Research Department:



HAWKINS MINE  
ANNUAL REPORT  
YEAR 1949

8. BENEFICIATION:  
(Continued)

Hourly Operating Rates in Tons  
Crude & Concentrates  
1949 Season

	Crude		Concentrates	
	Total Operating	Net Operating	Total Operating	Net Operating
May	625.83	713.42	354.35	403.94
June	632.51	691.89	377.66	413.11
July	667.44	719.92	378.74	408.52
August	671.08	698.67	383.01	398.76
September	679.25	730.29	371.19	399.08
Total	653.92	710.66	379.98	412.98

Hawkins Mine - Wash Ore  
Averages of Mill Products

Product	% Fe.	% Sil.	
Plant Crude	43.73	31.71	
Crusher Product - Screen 0' Size	46.89	26.60	Coarse Conc.
Log Screen Oversize	58.48	10.39	Coarse Conc.
Classifier Product	55.02	16.69	Fine Conc.
Classifier Overflow	24.66	62.07	
Sizer Feed	33.92	47.45	
Sizer Concentrate	56.81	14.69	Fine Conc.
Sizer Tails	22.12	64.80	Tailing
Hydroseparator Tails	16.39	73.15	Tailing

Plant Product Distribution

Product	Tons	% Wt.		% Fe.	% Phos.	% Sil.
		Plant	Pit			
Crude through Plant	1,039,164	100.00	93.42	44.49	.034	31.75
Pit rock rejects	73,332	-	6.58	26.15	-	57.74
Pit Crude	1,114,369	-	100.00	43.28	.034	33.47
Coarse Concentrate	508,097	48.81	45.60	57.83	.044	11.50
Fine Concentrate	96,831	9.30	8.69	55.53	.034	16.32
Total Concentrate	604,928	58.11	54.29	57.47	.043	12.24
Fine Tails	436,109	41.89	39.13	27.29	-	57.55

Washing Plant Delays

	Total	Percent	% of 1592 Working Hours
Crude Ore	103.12	81.13	6.48
Crude Bin & Conv.	6.18	4.86	0.40
Power Failure	2.91	2.29	0.18
Crushers	.83	0.65	0.05
Log Washers	3.24	2.55	0.20
Classifiers	2.08	1.64	0.13
R.R. Cars and Tracks	3.67	2.89	0.23
Conc. Stockpiling	3.16	2.49	0.20
Clear Water Pumps	.67	0.53	0.04
Misc. Chutes	1.25	0.97	0.07
	127.11	100.00	7.98

HAWKINS MINE  
ANNUAL REPORT  
YEAR 1949

9. MAINTENANCE  
AND REPAIRS:

From the first of the year to the beginning of the ore season, the pit mining equipment and the concentrating equipment were given the necessary winter repairs. The winter repair program at the concentrator was shut down for a short time during the winter on account of extreme cold weather. The repair program on the concentrating equipment was again resumed immediately following the settlement of the strike in November and carried forward to the end of the year.

10. COST OF  
OPERATION:

a. Comparative Mining Costs:

<u>Crude Ore</u>	<u>1948 Cost</u> <u>Per Ton</u>	<u>1949 Cost</u> <u>Per Ton</u>
Drilling & Blasting	\$ .042	\$ .039
Power Shovels - Operating	.032	.024
Power Shovels - Maintenance	.008	.002
Trucks - Operating	.038	.034
Trucks - Maintenance	.008	.020
Tractors-Operating		.004
Tractors - Maintenance		.006
Store Wash Ore in Pit	.019	
Crushing and Screening		.013
Conveyors Operating	.017	.008
Pit Roads and Ramps	.009	.003
Pumping and Drainage	.013	.013
General Open Pit Expense	.013	.011
Open Pit Superintendent	.004	.003
Structure Drilling and Sampling	.014	.053
<u>Total Pit Operating,</u>	<u>\$ .217</u>	<u>\$ .233</u>
 <u>Concentrating:</u>		
Transportation	\$ .089	\$ .098
Washing	.063	.058
Electric Power	.030	.023
General Expense		.004
Buildings and Machinery - Maintenance	.032	.033
Stocking Concentrates		.002
<u>Total Concentrating,</u>	<u>\$ .214</u>	<u>\$ .218</u>



HAWKINS MINE  
ANNUAL REPORT  
YEAR 1949

10. COST OF  
OPERATION:  
(Continued)

a. Comparative Mining Costs: (Cont'd)

	<u>1948 Cost</u> <u>Per Ton</u>	<u>1949 Cost</u> <u>Per Ton</u>
<u>General Mine Expenses:</u>		
Mining Engineering,	\$ .013	\$ .013
Mechanical & Electrical Engineering	.002	.005
Analysis and Grading	.022	.022
Safety Department	.002	.002
Special Expense	.001	.001
Ishpeming Office Expense	.003	.004
District Office Expense	.019	.023
Mine Office Expense	.025	.026
Insurance - Property, etc.	.006	.014
Personal Injury Expense	.006	.006
Social Security Taxes	.009	.004
Geological and Metallurgy	.001	.010
Employees Vacation Pay	.014	.017
	<hr/>	<hr/>
<u>Total General Mine Expenses,</u>	<u>\$ .123</u>	<u>\$ .147</u>
Idle and Winter Expense,	<u>\$ .284</u>	<u>\$ .373</u>
<u>Cost of Production,</u>	<u>\$1.030</u>	<u>\$1.179</u>

b. Detailed Cost Comparison:

The mining of crude ore showed an increase of approximately \$.020 over that secured in 1948, due entirely to a much higher cost in structure drilling and sample drilling. The latter due to an intensified drilling program at the property.

The concentrating costs in 1949 were approximately the same as those in 1948 and were favorable.

There was an increase of approximately \$.020 in General Mine Expenses due, mainly, to an increase in Mine Office Expense and to an increase in the Geological and Metallurgical Expense. Other items compared favorably with the 1948 costs.

Idle and Winter Expense showed an increase of approximately \$.090 over 1948 due, largely, to a more extensive repair program and to some expense from the steel strike in October and November.

HAWKINS MINE  
ANNUAL REPORT  
YEAR 1949

11. EXPLORATIONS  
AND FUTURE  
EXPLORATIONS:

An extensive drilling program was carried forward throughout the entire year in order to completely re-drill the property for a review by the Tax Commission in 1950 or 1951. A total of 3,595 feet of drilling was completed during the year by the Leach Company, E. J. Longyear Company and a Company drill.

The results so far have added considerably to the ore reserves at the property and have indicated that it will be necessary to construct a retreat or high density plant at this property in 1951. Further additions to the reserves will be definitely proven in 1950 and the reserve tonnage at the Hawkins will be increased to a point where it will be feasible to move the concentrating plant from its present location to a site near the pit in order to save approximately \$.12 to \$.15 a ton on concentrates. This saving is now based on a 55% to 60% recovery and will be larger when low-recovery ores are handled in the retreat plant.

12. TAXES:

The following is a statement of the taxes for the Hawkins Mine for the years 1949 and 1948:

	1949	1948	Increase	Decrease
Hawkins Mine, (includes shops and locations)	\$102,882.00	\$79,524.09	23,357.91	
Hawkins Mine Washing Plant,	5,100.17	5,719.84		\$619.67
Hawkins Mine Aux. Lands,	1,030.67	1,127.86		97.19
Hawkins Personal Property,	12,811.68	8,112.14	4,699.54	-
<b>Total,</b>	<b>\$121,824.52</b>	<b>\$94,483.93</b>	<b>\$27,340.59</b>	
<b>Average Tax Rate,</b>	<b>248.14</b>	<b>191.65</b>	<b>56.49</b>	

The increase in ad valorem taxes is accounted for by the fact that there is a substantial increase in the tax rate.

The decrease in Washing Plant taxes is due to a decrease in tax rate in Lone Pine Township. This also applies to Auxiliary Lands.

The addition of new equipment accounts for the increase in personal property tax.

The large increase in the tax rate is largely due to increases in the rate for Village and School District. The School District accounts for most of it.



HAWKINS MINE  
ANNUAL REPORT  
YEAR 1949

13. ACCIDENTS AND  
PERSONAL INJURY:

There were two compensable accidents in 1949 at the Hawkins Mine, as follows:

Stanley Stupar, drill helper. Injured January 23rd. Drill bit was binding. While taking slack off, clamp slipped, catching Stupar's thumb of left hand between bit and clamp and cut same 1-1/2" long.

Edwin Eyberg, locomotive brakeman. Injured March 31st. Was in the act of making a coupling between cars at concentrate stockpile. He stepped back to give the engineer signal and his left leg broke through a crust of snow. This caused him to fall over, fracturing his left ankle.

14. PROPOSED NEW  
CONSTRUCTION:

It is expected that preliminary plans will be made in 1950 for the construction of a high density plant and for the moving of the present washing plant to a site near the bank of the pit. The actual construction and moving to be completed previous to the 1952 ore season.

15. EQUIPMENT AND  
PROPOSED  
NEW EQUIPMENT:

The following equipment was received at the Hawkins Mine during the year:

- 2 - 22-ton Euclid rear-dump trucks
- 1 - International KB-2 Pickup truck

New Equipment Proposed for 1950

- 2 - 22-ton Rear-dump Euclid trucks
- 1 - Bucyrus-Erie 5-yard Electric shovel
- 1 - Bucyrus-Erie 42-T 9" Churn Drill
- 1 - TD-24 Tractor and dozer
- 1 - Pickup truck

HILL-TRUMBULL MINE  
ANNUAL REPORT  
YEAR 1949

1. GENERAL

At the start of the year 1949, there was no stripping in progress at the Hill-Trumbull Mine. The normal winter repair program was in full swing on a 5-day week basis and was continued thus until the ore season. Shovels, drills, locomotives, dump cars and other mine equipment were given a general overhaul at the mine shops. Trucks, tractors and road patrol were given a thorough overhauling in an effort to reduce maintenance during the ore season. Necessary repairs to pit screening plant and conveyor were conducted. Routine work was done on the plant machinery, such as screens, pumps, conveyors and crushers.

At the washing plant, the equipment was given a general overhaul. Due to removal of the logs and two of the four classifiers at the close of the 1948 season, relocation of crusher conveyors and crusher under-size screens was necessary.

In the retreat plant, the major project of rearranging the flow-sheet was continued. The structure was completely remodeled, all machines repaired and relocated, resulting in a greatly improved plant layout.

Stockpile loading was begun on March 28th, continued through April and completed early in May, with a total of 131,575 tons loaded out.

The 1949 ore season began on May 9th, delayed one week because of retreat plant repair work. Operations were started on a 3-shift, 5-day week schedule and continued on this basis through the season, working an occasional sixth day when necessary. Using two shovels, serviced by six to eight trucks, 1,391,200 tons of crude ore (including direct ore) were produced. (Includes screen rejects).

Direct ore produced only from the Hill-Delaware trespass area amounted to 3,638 tons. Very little of this material remains.

Wash ore crude totaled 88,713 tons, from which 53,875 tons of washed concentrates were produced, with an average production per shift of 2,293 tons.

Retreat crude amounted to 1,298,639 tons, from which an estimated 818,143 tons of retreat feed were produced. This, in turn, gave 502,852 tons of retreat concentrates, for a shift average of 1,638 tons, showing a considerable improvement over the 1948 production figures.

Car shortages and grading forced the stockpiling of 118,972 tons of concentrates during the 1949 season.

A scrambling operation, involving a shovel and one or two trucks was conducted intermittently throughout the season in the East Hill forty. Ore was stocked in the pit for later removal to the mill.



HILL-TRUMBULL MINE  
ANNUAL REPORT  
YEAR 1949

1. GENERAL  
(Continued)

Because of the general steelworkers' strike, operations ceased abruptly on September 27th. The plants were cleaned out and were not started when the strike ended November 13th. Stockpile loading in November, totaling 15,763 tons, completed shipments for the year.

Following the strike, stripping was begun on November 15th and completed on December 18th, with 225,082 cubic yards of surface removed from the North side of the Hill lease. Pit operations then ceased for the year and equipment was moved out for repair.

Due to expansion of the Gross-Marble Mine, relocation of mine roads, tracks and power lines was required, as well as installation of 1,800 feet of conveyor. This project was begun after the strike.

A new exploration program was begun in May on the Potter forty adjoining the Trumbull lease to the West. This was continued until August, when the drill was moved to the Trumbull and later to the Hill lease for exploration along the North bank of the pit.

2. PRODUCTION,  
SHIPMENTS &  
INVENTORIES:

a. Production by Grades:

Hill Crude, -----	49,971 tons
Trumbull Crude, -----	840 "
Hill Retreat Crude, -----	165,168 "
Trumbull Retreat Crude, -----	<u>1,011,821 "</u>
Total Hill-Trumbull Crude, -----	1,227,800 "
Delaware Crude (Oliver) -----	27,287 "
Hill-Annex Crude (Inter-State) -----	<u>7,030 "</u>
Grand Total Crude, -----	1,262,117 "
Hill Bessemer Concentrates, -----	10,165 "
Hill Non-Bessemer Concentrates, -----	21,309 "
Hill Bessemer Retreat Concentrates, -----	52,313 "
Hill Non-Bessemer Retreat Concentrates, -----	22,372 "
Trumbull Bessemer Concentrates, -----	464 "
Trumbull Non-Bessemer Concentrates, -----	81 "
Trumbull Bessemer Retreat Concentrates, -----	160,273 "
Trumbull Non-Bessemer Retreat Concentrates, -----	<u>267,894 "</u>
Grand Total Production, -----	534,871 "
Hill-Trumbull.	
Delaware Concentrates, -----	16,857 "
Delaware Direct, -----	<u>3,638 "</u>
Total Delaware Production, -----	20,495 "
Hill-Annex Concentrates, -----	<u>4,999 "</u>
Grand Total Production, -----	560,365 "

HILL-TRUMBULL MINE  
ANNUAL REPORT  
YEAR 1949

2. PRODUCTION,  
SHIPMENTS &  
INVENTORIES:  
(Continued)

b. Shipments:

Hill Bessemer Concentrates, -----	10,165	tons
Hill Non-Bessemer Concentrates, -----	19,122	"
Hill Bessemer Retreat Concentrates, -----	52,313	"
Hill Non-Bessemer Retreat Concentrates, -----	28,326	"
Trumbull Bessemer Concentrates, -----	2,818	"
Trumbull Non-Bessemer Concentrates, -----	35,700	"
Trumbull Bessemer Retreat Concentrates, -----	160,273	"
Trumbull Non-Bessemer Retreat Concentrates, -----	256,819	"
Total Hill-Trumbull Shipments, -----	565,536	"
Delaware Concentrates, -----	16,857	"
Delaware Direct, -----	3,638	"
Total Delaware Shipments to Oliver Iron Mining Company, -----	20,495	"
Hill-Annex Shipments to Inter-State Iron Company,---	4,999	"

c. Stockpile Inventories:

On June 1, 1949, there were in stock at the Hill-Trumbull plant, 37,973 tons of washed concentrates and 95,901 tons of retreat concentrates, for a total of 133,874 tons. This pile was loaded out completely in March, April and May. On December 31, 1949, there were again in stockpile 2,187 tons of Hill wash and 101,022 tons of retreat concentrates, for a total of 103,209 tons.

d. Production by Months:

(1) Crude Ore

<u>MONTH</u>	<u>HILL WASH</u>	<u>HILL RETREAT</u>	<u>TRUMBULL WASH</u>	<u>TRUMBULL RETREAT</u>	<u>TOTAL</u>
May,	14,429	37,567	840	102,785	155,621
June,	799	117,155	-	165,102	283,056
July,	10,283			236,688	246,971
August,	21,159			275,564	296,723
September,	3,301	10,446		231,682	245,429
Total,	49,971	165,168	840	1,011,821	1,227,800



HILL-TRUMBULL MINE  
ANNUAL REPORT  
YEAR 1949

2. PRODUCTION,  
SHIPMENTS &  
INVENTORIES:  
(Continued)

d. Production by Months: (continued)  
(2) Concentrates:

<u>MONTH</u>	<u>HILL</u> <u>WASH</u>	<u>HILL</u> <u>RETREAT</u>	<u>TRUMBULL</u> <u>WASH</u>	<u>TRUMBULL</u> <u>RETREAT</u>	<u>TOTAL</u>
May	10,359	16,063	463	42,281	69,166
June	633	53,561		67,347	121,541
July	6,156			97,998	104,154
August	12,139			115,028	127,167
September	2,187	5,061		105,513	112,761
November			82		82
<b>Total,</b>	<b>31,474</b>	<b>74,685</b>	<b>545</b>	<b>428,167</b>	<b>534,871</b>

f. Ore Statement:

As of December 31, 1949, there is in stockpile the following ores:

Hill Washed Concentrates,	2,187 tons
Trumbull Washed Concentrates,	-
Total Washed Concentrates,	2,187 tons
Hill Retreat Concentrates,	11,576 "
Trumbull Retreat Concentrates,	89,446 "
Total Retreat Concentrates,	101,022 "
Grand Total,	103,209 "

3. ANALYSIS:

a. Analysis of Crude Ore:

	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>
Hill Wash Ore,	49,971	45.17	.037	30.66
Hill Retreat Ore,	165,168	37.80	.029	41.48
Trumbull Wash Ore,	840	38.60	.034	39.80
Trumbull Retreat Ore,	1,011,821	34.84	.030	45.16
<b>Total,</b>	<b>1,227,800</b>	<b>33.66</b>	<b>.030</b>	<b>44.07</b>

HILL-TRUMBULL MINE  
ANNUAL REPORT  
YEAR 1949

3. ANALYSIS:  
(Continued)

b. Tonnage & Analysis of Production:

	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alu.</u>	<u>Moist.</u>	<u>Fe. Nat.</u>
Hill Bess. Concs.	10,165	61.40	.042	7.86	.11	.43	7.03	57.08
Hill N.B. Concs.	21,309	60.00	.053	7.93	.12	.43	7.82	55.31
Hill Bess. Re- treat Concs.	52,313	57.81	.038	11.07	.13	.39	6.61	53.99
Hill N.B. Re- treat Concs.	22,372	54.98	.048	13.21	.15	.42	5.84	51.77
Trumbull Bess. Concs.	464	54.21	.042	14.72	.26	.40	6.40	50.74
Trumbull N.B. Concs.	81	51.30	.043	20.40	.13	.40	5.50	48.48
Trumbull Bess. Ret. Concs.	160,273	56.12	.041	12.13	.13	.40	6.41	52.52
Trumbull N.B. Ret. Concs.	267,894	55.80	.047	12.89	.13	.42	5.23	52.88
<b>Total,</b>	<b>534,871</b>	<b>56.33</b>	<b>.044</b>	<b>12.21</b>	<b>.13</b>	<b>.41</b>	<b>5.88</b>	<b>53.02</b>

c. Tonnage and Analysis of Shipments:

Hill Bess. Conc.	10,165	61.40	.042	7.86	.11	.43	7.03	57.08
Hill N.B. Concs.	19,122	59.93	.053	7.62	.12	.44	7.94	55.17
Hill Bess Re- treat Concs.	52,313	57.81	.038	11.07	.13	.39	6.61	53.99
Hill Non-Bess. Ret. Concs.	28,326	55.42	.046	14.28	.13	.41	5.84	52.18
Trumbull Bess. Concs.	2,818	53.94	.045	15.31	.16	.42	5.49	50.98
Trumbull N.B. Concs.	35,700	54.26	.047	15.57	.12	.42	5.63	51.21
Trumbull Bess. Ret. Concs.	160,273	56.12	.041	12.13	.13	.40	6.41	52.52
Trumbull N.B. Ret. Concs.	256,819	55.63	.048	13.09	.13	.41	5.59	52.52
<b>Total,</b>	<b>565,536</b>	<b>56.11</b>	<b>.045</b>	<b>12.58</b>	<b>.13</b>	<b>.41</b>	<b>6.04</b>	<b>52.72</b>

d. Mine Analysis of Ore in Stockpile:

Hill Wash Concs.	2,187	60.60	.053	10.67	.13	.37	6.81	56.47
Hill Retreat Concs.	11,576	56.78	.040	12.02	.12	.39	6.67	52.99
Trumbull Re- treat Concs.	89,446	55.37	.045	13.90	.12	.41	5.74	52.19
<b>Total,</b>	<b>103,209</b>	<b>55.64</b>	<b>.045</b>	<b>13.62</b>	<b>.12</b>	<b>.40</b>	<b>5.87</b>	<b>52.37</b>



HILL-TRUMBULL MINE  
ANNUAL REPORT  
YEAR 1949

3. ANALYSIS  
(Continued)

e. Complete Analysis of Shipments:

	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alu.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss</u>
Hill Bess. Concs.	61.40	.042	7.86	.11	.43	.27	.18	.010	3.23
Hill Non-Bess. Concs.	59.93	.053	7.62	.12	.44	.26	.17	.011	5.83
Hill Bess. Retreat Concs.	57.81	.038	11.07	.13	.39	.27	.17	.011	5.16
Hill Non-Bess. Retreat Concs.	55.42	.046	14.28	.13	.41	.26	.17	.010	5.34
Trumbull Bess. Concs.	53.94	.045	15.31	.16	.42	.25	.17	.011	6.38
Trumbull N.B. Concs.	54.26	.047	15.57	.12	.42	.25	.16	.011	5.73
Trumbull Bess. Ret. Concs.	56.12	.041	12.13	.13	.40	.24	.16	.010	6.54
Trumbull N.B. Ret. Concs.	55.63	.048	13.09	.13	.41	.26	.16	.011	6.23

4. ESTIMATE OF ORE RESERVES:

a. Developed Ore:  
Factors:

	<u>Cu. Ft. Per Ton</u>	<u>Rock Deduction</u>	<u>% Recovery</u>
Merch. Ore,	14	-	100.00
Wash Conc.	14		59.58
Lean Wash Conc.	14		47.40
Low Grade Wash Conc.	14		59.51
Lean Low Grade Wash Conc.	14		49.70
Retreat Conc.	14		40.00

	<u>RESERVE 12--31-48</u>	<u>MINED 1949</u>	<u>BAL. AFTER MINING</u>	<u>CHANGED BY RE-EST</u>	<u>RESERVE 12-31-49</u>
<u>Trumbull Mine</u>					
NW-SW 17,56-23,	467,728	167,735	299,993	+ 144,059	444,052
NE-SW 17,56-23,	409,460	260,977	148,483	+ 500,482	648,965
<b>Total Trumbull,</b>	<b>877,188</b>	<b>428,712</b>	<b>448,476</b>	<b>+ 644,541</b>	<b>1,093,017</b>
<u>Hill Mine</u>					
SE-NW 17,56-23,	38,401	22,055	16,346	+ 91,009	107,355
SW-NE 17,56-23,	301,085	60,468	240,617	+ 121,715	362,332
SE-NE 17,56-23,	227,171	23,636	203,535	+ 79,247	282,782
<b>Total Hill,</b>	<b>566,657</b>	<b>106,159</b>	<b>460,498</b>	<b>+ 291,971</b>	<b>752,469</b>
<b>Grand Total,</b>	<b>1,443,845</b>	<b>534,871</b>	<b>908,974</b>	<b>+ 936,512</b>	<b>1,845,486</b>

HILL-TRUMBULL MINE  
ANNUAL REPORT  
YEAR 1949

4. ESTIMATE OF  
ORE RESERVES:  
(Continued)

b. Prospective Ore:

The above reserve of 1,845,486 tons at the property represents the balance from the former estimate after deducting shipments. During 1950 and prior to May 1, 1951 there will be a reestimate for tax purposes of the Hill-Trumbull Mine by the State Tax Department and it will, therefore, be necessary that Cleveland-Cliffs completely re-estimate this property prior to that time. This will mean a sizeable increase in the reserves, due almost entirely to the inclusion of ores which now can be useable through the rapid progress that has been made in the past two years in the treatment of low grade retreat ores.

c. Estimated Analyses:

<u>Grade</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alu.</u>
<u>Hill:</u>						
Non-Bessemer Direct,	21,257	59.63	.062	9.39	.20	.43
Bess. Wash Concs.	270,733	61.73	.029	9.23	.11	.47
Non-Bess. Wash Concs.	161,251	60.02	.047	9.11	.11	.43
Bess. Retreat Concs.	188,748	57.52	.040	12.20	.12	.47
Non-Bess. Retreat Conc.	110,480	57.05	.046	13.37	.12	.48
Total Hill,	752,469	59.56	.039	10.56	.12	.45
<u>Trumbull:</u>						
Bess. Wash Concs.	146,889	60.02	.039	6.04	.15	.49
Non-Bess. Wash Concs.	213,927	59.16	.056	7.59	.12	.51
Bess. Retreat Concs.	229,005	56.88	.042	10.80	.14	.49
Non-Bess. Retreat Conc.	503,186	56.30	.046	11.64	.14	.49
Total Trumbull,	1,093,017	57.48	.046	9.92	.14	.49
Total Direct,	21,257	59.63	.062	9.39	.20	.43
Total Bess. Wash Conc.	417,622	61.13	.033	8.11	.12	.48
Total Non-B. Wash Conc.	375,188	59.53	.052	8.24	.12	.48
Total Wash Conc.	792,810	60.37	.042	8.17	.12	.48
Total Bess. Ret. Conc.	417,753	57.17	.041	11.43	.13	.48
Total N.B. Ret. Conc.	613,633	56.44	.046	11.95	.14	.49
Total Retreat Conc.	1,031,486	56.73	.044	11.74	.14	.49
Total Bess. Conc.	835,375	59.15	.037	9.77	.13	.48
Total N. Bess. Conc.	1,010,111	57.65	.049	10.52	.13	.49
Grand Total,	1,845,486	58.33	.044	10.18	.13	.49



HILL-TRUMBULL MINE  
ANNUAL REPORT  
YEAR 1949

5. LABOR & WAGES:

a. Comments:

Labor was more plentiful this year than for many years past and, as a result, a better quality of men was obtainable. There was a general steelworkers' strike for pensions and insurance, lasting from September 30th to November 13th, during which period the mine was completely closed. There were no other labor disturbances and Company-Union relations continued good.

b. Comparative Statement of Production and Wages:

<u>PRODUCTION</u>	560,365 tons
Number of Shifts and Hours,	3 - 8-hour
Average Number of Men Working,	135 $\frac{1}{4}$
Average Wages per Day,	\$12.35
Product Per Man Per Day	26.24
Labor Cost per Ton	.708
Total Number of Days	108
Amount Paid for Labor,	\$396,627.29

6. SURFACE:

a. Buildings and Repairs:

The retreat plant was completely sheeted in and re-roofed with corrugated iron. A new roof was laid on the main shop building. Other than this, only minor and necessary repairs were made to the mine buildings.

b. Roads, Transmission Lines, Tracks, & Construction:

Due to the encroachment of Oliver Iron Mining Company's Gross-Marble Mine on our operating area, it was necessary to build a new road into the mine, relocate the main transmission line to the pit and abandon about a quarter of a mile of trackage, leading from the mine yard to the loading pocket. This required moving the loading pocket to a new location southwest of the mine office, re-location of about one-half mile of tracks and trolley line, and construction of 1,800 feet of 30 inch conveyor, including two transfers, leading from the conveyor tunnel to the re-located loading pocket. This work was begun after the strike settlement and will be completed for the 1950 ore season.

7. OPEN PIT:

a. Stripping:

There was no stripping in progress at the beginning of the year, nor was any done during the ore season, save for a small amount of cleanup immediately preceding and during the early part of the ore season. This amounted to 6,000 cubic yards.

On November 15th, immediately after the strike settlement, stripping was begun on the North side of the Hill. This project, E&A MC-158, called for the removal of 250,000 cubic yards of surface

HILL-TRUMBULL MINE  
ANNUAL REPORT  
YEAR 1949

7. OPEN PIT  
(CONTINUED)

a. Stripping: (continued)

material in the North extension toward the Barbara. Exploratory drilling during the summer indicated the advisability of extending the area developed last season, uncovering some additional ore and re-locating the road to the surface and rock dumps North of the pit.

Stripping operations were conducted on a 20-shift per week schedule, using 4 crews on a forty-hour basis. Due to the confined working area, only one shovel was used, served by 7-8 trucks. A total of 225,082 cubic yards was moved, for a shift average production of 2,447 cubic yards, and a cost per cubic yard of \$.266. Despite the limited working area, which made for poor shovel loading, good production was obtained, with a resultant good cost. Stripping was completed, except for a small amount of cleanup, on December 18th, the mine shut down and equipment moved out for repair. Remainder of the dirt will be picked up in the spring, prior to the ore season.

The following tabulation shows the stripping material moved during 1949:

<u>Lease</u>	<u>Surface</u> <u>Cu. Yds.</u>	<u>Waste Ore</u> <u>Cu. Yds.</u>	<u>Lean Ore</u> <u>Cu.Yds.</u>	<u>Total</u> <u>Cu. Yds.</u>
Hill,	225,082			225,082
Trumbull,				-

b. Open Pit Mining:

The 1949 ore season began on May 9th, on a 3-shift, 5-day week basis. This schedule continued through the season, working 6 days per week, when necessary, until the steelworkers' strike terminated mining operations on September 27th. Operating two shovels, serviced by 6-8 trucks, the pit produced 1,391,200 tons of direct, wash and retreat crude in 306 shifts, for an average production per shift of 4,546 tons. Of this total produced, 121,807 tons was removed as screening plant reject rock, leaving 1,265,755 tons as net crude ore sent to the mill, or shipped. This gave a net crude average shift production of 4,136 tons. Mining cost per ton of crude ore was \$0.173. The percentage of rock mined with the ore increased in 1949 over previous years, due to the leaner, harder nature of the retreat crude. In addition to the screening plant rock, which amounted to 9.91% of the total crude, 21,045 tons of rock were sorted out at the shovels and loaded out directly to the rock dump. This tonnage amounted to 1.51% of the total crude ore produced and also showed an increase over previous years.

The small amount, 3,638 tons, of direct ore was mined entirely from the Hill-Delaware trespass area. Of 88,713 tons of wash crude produced, 76,267 tons were produced from this area, with 3,721 tons



HILL-TRUMBULL MINE  
ANNUAL REPORT  
YEAR 1949

7. OPEN PIT  
(Continued)

b. Open Pit Mining: (continued)

coming from the East Hill scam area and 7,885 tons from a Hill-Annex trespass. Trumbull wash crude amounted to only 840 tons, mined for experimental purposes. Retreat ore was produced from both leases, totaling 1,298,639 tons. Of this, 1,112,994 tons were obtained from the Trumbull, mainly from the North and West end areas of the Trumbull lease. Hill retreat crude amounted to 185,645 tons. The major portion coming from the North bank in the area of the extension toward the Barbara, with a small tonnage from scam operations.

Retreat ores mined during the first half of the season were of fair grade and, with improvements in plant operation and metallurgy, gave a fair concentrate. However, during the latter part of the operations, the grade of crude went down as the ores became harder, more blasting was required and mining costs and grade of concentrate suffered accordingly.

A scam crew worked intermittently in the Hill lease, sorting ore and rock in small areas of partial concentration. The ore was stockpiled in the pit and later loaded out to the mill. In addition to Hill wash and retreat ores, this operation produced 7,885 tons of Hill-Annex trespass wash crude, mined from the Hill-Annex because of its inaccessibility to their operations. Cost of producing ore in this area is high and production low because of excessive rock that must be sorted at the shovel. However, the plant is now handling this ore satisfactorily and it is the plan to continue a small operation in the scam area in order that it may be worked out with the rest of the pit.

c. Pumping and Drainage:

Pit drainage was handled by the deep-well pump until August, when stripping advance at the Gross-Marble Mine forced removal of this pump and installation of a pit pump and pipe lines. Since no mining was done in the pit bottom, pit water was successfully handled by this unit at little expense. Pumping charge for the year was \$.004 per ton.

d. General Pit Activities:

Pit activity at the Hill-Trumbull Mine was confined to the mining of ore. Except for scam rock and rock sorted at the shovels and screening plant, no rock or lean ore was moved during the operating season.

HILL-TRUMBULL MINE  
ANNUAL REPORT  
YEAR 1949

8. BENEFICIATION:

a. Washing Plant:

The washing plant operating schedule followed that of the pit, starting May 9th and shutting down September 27th, when the steel-strike forced curtailment of operations. Operating 304-1/2 shifts, this plant washed 1,265,755 tons of crude, of which 85,128 tons were wash and 1,176,989 tons retreat. Plant production totaled 872,018 tons, of which 53,875 tons were washed concentrates and 818,143 tons retreat feed. Crude feed to the mill averaged 4,157 tons per shift, with an average concentrate production of 2,850 tons. Weight recovery on wash ore was 60.7% and on retreat feed was estimated at 63.0%.

Operation of the washing plant was satisfactory during the season, although considerable delay was experienced at the start of the season, due to untried installations. Correction of these was simple, however, and once made, few troubles were encountered for the balance of the season. Removal of the log washers improved operations considerably and indicated no appreciable loss in washing efficiency.

Because of car shortages and grading problems, 2,187 tons of washed concentrate was placed in stockpile.

Following is a brief statement showing time lost and percentage of total operating time:

<u>Source of Delay</u>	<u>Hours Lost</u>	<u>% of Total Wk. Hrs.</u>
No crude ore	84.92	3.48
Electrical - no power	2.92	.12
Screens,	37.25	1.53
Crushers	-	-
Conveyors	11.83	.49
Classifiers	30.92	1.27
Pumps and Pipe Lines	4.83	.20
Loading Track	4.92	.20
Miscellaneous	4.02	.17
	181.61	7.46

The analysis of the plant rejects for the season 1949 is as follows:

<u>Lease</u>	<u>Tons</u>	<u>Iron</u>
Hill	1,455	24.09
Trumbull	-	-

The complete concentration data for the year 1949 was as follows:



HILL-TRUMBULL MINE  
ANNUAL REPORT  
YEAR 1949

8. BENEFICIATION:  
(continued)

a. Washing Plant: (continued)

	<u>Tonnage</u>	<u>% Total Mined</u>	<u>% Iron Dried</u>	<u>Tonnage Recovery</u>	<u>Iron Unit Recovery</u>
Crude ore and rock mined	52,266	100.00	44.48		
Less: Rock removed in mining	-	-	-		
Crude ore transported to Mill	52,266	100.00	44.48		
Less; Rock removed in screening plant	1,455	2.78	24.09		
Crude ore entering mill	50,811	97.22	45.06		
Concentrates produced	32,019	61.26	60.34	63.02	84.38
Rock rejects on mill picking belt,	-	-	-		
Tailings (by deduction)	18,792	35.96	19.02		

b. Retreat Plant:

Starting operations on May 9th, this plant followed the same schedule as the pit and washing plant. Operating 307 shifts during the season, this plant consumed 818,143 tons of washed retreat feed, from which 502,852 tons of concentrate was recovered, at an average shift production of 1,638 tons and net weight recovery of 42.7%. Stockpiled retreat concentrate totaled 116,785 tons.

Complete re-design of the retreat plant, undertaken after the 1948 season, proved of considerable benefit in improving capacity of the plant and grade of concentrate. Use of wedge bar screens cut down screen lost time and maintenance materially. The Hardinge separator proved to be an excellent machine for this type of service and gave almost no trouble. Use of a surge pile from which to feed the plant, proved beneficial in that flow of ore was more even and continuous, improving operation of the heavy density process and reducing delays, due to lack of feed. The Humphrey spirals, operating on the -1/8" fraction of the ore, proved unequal to the task of concentrating very lean retreat ores and it appears evident that they are not the final answer in fine concentration. However, at present there is no process or machine available that will do enough better to warrant a change and they will be run, with whatever improvements possible to devise, until experimentation indicates what course should be followed.

Operations during the latter part of the season on very lean, hard retreat ores again indicated the need for finer crushing. Present reduction of oversize to 1-1/4" is not sufficient on these ores as too much silica is left "frozen" to the ore seams. Finer

HILL-TRUMBULL MINE  
ANNUAL REPORT  
YEAR 1949

8. BENEFICIATION  
(continued)

b. Retreat Plant: (continued)

crushing appears to be the only solution to the problem of freeing the iron bands from the silica bands. If reserves can be developed sufficient to justify increasing crusher capacity, this will have to be done in the near future.

The following is a brief classification of plant delays, showing time lost and percentage of total time:

<u>Source of Delay</u>	<u>Hours Lost</u>	<u>% of Total Wk. Hours</u>
No ore	3.83	.15
Surge pile	34.00	1.38
Conveyors	21.42	.87
Screens	31.33	1.28
Pumps and Pipe Lines	32.75	1.33
Media Circuit	10.58	.43
Loading Track	3.17	.14
Electrical	17.17	.70
Spirals and Ball Mill	11.58	.47
Miscellaneous	11.17	.45
	177.00	7.20

The concentration data for the year 1949 is as follows:

	<u>Tonnage</u>	<u>% Total Mined</u>	<u>% Iron Dried</u>	<u>Tonnage Recovery</u>	<u>Iron Unit Recovery</u>
Crude ore and rock mined	1,318,819	100.00	33.70		
Less: Rock removed in mining	20,180	1.53	21.76		
Crude ore transported to mill	1,298,639	98.47	33.89		
Less; Rock rejects in screening plant,	121,650	9.22	20.63		
Crude ore entering mill	1,176,989	89.25	35.26		
Retreat concentrates produced	502,852	38.13	56.08	42.72	67.95
Retreat rejects	170,594	12.94	22.06		
Tailings (by deduction)	503,543	38.18	18.94		

9. MAINTENANCE  
AND REPAIRS:

From the first of the year, until the start of the ore season, repairs to all pit loading, hauling and drilling equipment were conducted. Trucks, tractors and patrols were given a more thorough going over than ever before, in an attempt to reduce maintenance problems during the ore season. Plant repairs and changes were extensive and have been



HILL-TRUMBULL MINE  
ANNUAL REPORT  
YEAR 1949

9. MAINTENANCE  
AND REPAIRS:  
(Continued)

covered under "beneficiation". At the close of the 1949 ore season, preparations were begun to install a crude ore feeder in the pit screening plant. It is expected that this will materially improve operation of this unit, improving screen efficiency and thereby reducing loss of ore in the screen reject. It will also give more crude storage capacity, allowing trucks to dump quicker and giving a reserve of ore in case of minor delays.

At the plants, repairs, following the close of the 1949 season, were of a general nature, with few major changes. Most important was the installation of a conveyor to dispose of retreat rock rejects, thereby eliminating use of trucks for this purpose.

10. COST OF  
OPERATION:

a. Comparative Mining Costs:

<u>PRODUCT</u>	<u>1949</u> <u>BUDGET</u>	<u>1949 COST</u> <u>PER TON</u>	<u>1948 COST</u> <u>PER TON</u>
Direct Shipping Ore	29,000	3,638	145,131
Wash Concentrates	126,000	53,875	262,203
Retreat Concentrates	520,000	502,852	361,060
Total Production	675,000	560,365	768,394
(Recovery)	42.0%	40.1%	46.5%
Average Daily Output		5,189	5,777
Tons Per Man Per Day		26.24	30.26
Days Operated		108	133
<u>COST</u>			
Pit Operating	\$.187	\$.173	\$.170
Concentrating	.501	.532	.548
Loading Stockpile Ore	.001	.057	.001
General Mine Expense	.131	.178	.127
Idle and Winter Expense	.350	.624	.351
Cost of Production	\$1.394	\$1.773	\$1.252
Depreciation- Plant & Equipment	-	.056	.059
Depreciation- Motorized Equipment		.057	.031
Amortization- Stripping		.314	.307
Taxes - Ad Valorem		.097	.076
Taxes - Occupational		.097	.051
Taxes Royalty,		.082	.068
Total Cost at Mine	-	\$2.476	\$1.844
Administrative Expense		.098	.096
Misc. Expense & Income		.006	.017
Grand Total,	-	\$2.580	\$1.923



HILL-TRUMBULL MINE  
ANNUAL REPORT  
YEAR 1949

10. COST OF  
OPERATION:  
(Continued)

a. Comparative Mining Costs: (cont'd)

The cost per ton figures for 1948 and 1949 are both taken from the mine cost sheets before final revision by the Cleveland office and are, therefore, comparable.

b. Detailed Cost Comparison:

In scheduling the 1949 production, it was estimated that greater quantities of direct and wash would be produced than actually were. Decrease in direct was due largely to errors in drilling, which indicated direct when the material was, in reality, a high grade wash ore. Less wash ore was produced than estimated, because no mining was done in the Trumbull pit bottom, where wash ore would have been encountered.

Because the form of the cost sheet has been changed, the 1948 costs and 1949 budget figures have been fitted into the new sheet to conform with the 1949 costs. This makes comparison with 1948 figures and budget possible.

Pit operating cost showed a slight increase over the 1948 figures, but was \$.014 under the 1949 budget. Drilling and Blasting charges increased \$.024 over 1948 and \$.012 over the budget, but this was offset by reductions in such items as shovel and truck operation and maintenance, drainage and scrambling. The large increase in drilling cost was due, almost entirely, to the harder ore mined, all of which required heavy blasting. Variation in other items of pit operating costs were minor.

Concentrating costs showed a decrease of \$.016 from the 1948 costs, but was \$.031 over the budget. This can be explained, in part, by the decreased amount of wash ore produced, which, of course, increased the percentage of higher cost retreat concentrates. Transportation and washing plant costs were under the budget, but retreat costs for 1949 at \$.246 was \$.051 over the 1948 cost and \$.053 over the budget. This is due, in part, to the lower recovery obtained this season and to the decrease in the amount of wash concentrate produced.

General Mine Expense showed a rise of \$.051 over 1948 and \$.047 over the budget figure, with increases showing in all items. This increase is due to the lower tonnage produced than was originally estimated.

Idle and winter expense showed a large increase of \$.273 over the 1948 figure and \$.274 over the 1949 budget estimate. This increase is due, in part, to the extra expenses involved in re-designing and repairing the plants during the winter repair season. This cost was again increased when the tonnage was reduced and again increased when the steel strike cut off production.



HILL-TRUMBULL MINE  
ANNUAL REPORT  
YEAR 1949

11. EXPLORATION  
AND FUTURE  
EXPLORATION:

No exploratory work was in progress at the start of the year 1949. In May, drilling was begun on the Potter forty adjoining the Trumbull lease to the West, where five holes, totaling 671 feet, were drilled. This gave sufficient drilling information to indicate the presence of a low grade possible retreat ore body and no further drilling is contemplated, pending completion of a test pit in this area.

The drill was moved to the West Trumbull forty, where four holes were drilled on the North side of the pit. While this information was being evaluated, three holes, totaling 490 feet, were drilled in the Hill lease on the North bank to get additional information for the stripping area under consideration. The drill was then moved back to the Trumbull, where two holes, totaling 257 feet, were drilled in the same area.

The Trumbull drilling indicates an extension of lean retreat ore under the North bank of the pit. It is hoped that this area will extend into the Potter forty, making access to the latter area much easier in the event mining there is undertaken.

The Hill drilling continues to show low grade retreat ore, but is promising enough to indicate that further exploration is desirable. This program will be continued in 1950 in an effort to block out a substantial tonnage in the area extending from the Hill pit Northeast toward the Barbara.

12. TAXES:

The following table shows a comparative statement of taxes and average rate at the Hill-Trumbull Mine for the years 1949 and 1948:

	1949	1948	<u>Increase</u>	<u>Decrease</u>
Hill Mine	\$17,017.27	\$17,958.23		\$ 940.96
Trumbull Mine	20,034.70	20,701.66		666.96
Hill-Trumbull Shops	1,330.71	1,151.51	\$ 179.20	
Hill-Trumbull W.P.Lands	10,476.10	8,562.71	1,913.39	
Personal Property,	5,697.61	6,106.47		408.86
 Total,	 \$54,556.39	 \$54,480.58	 \$ 75.81	
Village Lots	550.31	476.17	74.14	
 Grand Total	 \$55,106.70	 \$54,956.75	 \$ 149.95	
 Average Tax Rate	 146.31	 124.87	 21.44	



HILL-TRUMBULL MINE  
ANNUAL REPORT  
YEAR 1949

12. TAXES:  
(Continued)

The decrease in ad valorem taxes is due to the fact that the ore reserve tonnages were reduced by the amount of the shipments during the 1949 ore season.

The increase for the Hill-Trumbull shops is the result of the increased tax rate.

The increase for the Washing Plant Lands is the result of the increased tax rate.

The decrease in Personal Property tax is due to a reduction in the taxable value of equipment.

The increase in the tax rate is due largely to increases in the County and School District tax.

13. ACCIDENTS AND  
PERSONAL INJURY:

There were six lost-time accidents during 1949, which are described as follows:

Name: Onni Maki Date: November 21st.  
Cause: Maki was helping to erect a 35-ft. pole to be used for the truck stripping power service station. The pole was about half-way up, when it rolled, letting out the pikes. The pole fell, hitting Maki on his left side of back and hip.

Nature: Pain and tenderness over lower spine, left hip joint and left kidney region. Taken to Mesaba Clinic at Coleraine by stretcher and ambulance for X-ray. Fracture left lumbar traverse process. Taken to Hibbing General Hospital (via ambulance)

Time Lost: (Had not returned to work as of Dec. 31, 1949)

Compensation: - -

Name: Harold Bundy Date: September 16th.

Cause: While Bundy was walking up in the plant, a foreign body entered his right eye. He also complained of sore eyes, due to an arc flash.

Nature: Foreign body removed from right eye. Patient also has an arc flash.

Time Lost: 3 weeks - 1 day

Compensation: \$ 65.00



HILL-TRUMBULL MINE  
ANNUAL REPORT  
YEAR 1949

13. ACCIDENTS AND  
PERSONAL INJURY:  
(Continued)

Name: Anthony Virginia Date: July 30th.

Cause: Virginia was proceeding forward with Lull Loader and one wheel went down in a small depression in the ground. This caused the steering wheel to spin, catching Virginia's left thumb and fracturing his left wrist.

Nature: Fracture of navicular bone - left wrist, linear fracture with no displacement. (Splint applied).

Time Lost; 2 Weeks

Compensation: \$ 30.00

Name: Morten Mortenson Date: February 3rd.

Cause: Mortensen was helping vulcanizer put reel on stand. Bar in middle of reel bent, stand went sideways, and he got fingers on left hand between rod and reel stand.

Time Lost: 5 Weeks - 4 Days

Compensation: \$ 153.00

Name: Harold Bundy Date: January 13th.

Cause: Bundy was burning when something unknown got into his right eye and scratched it. He thinks something must have entered his eye when he had his goggles raised to see his work better.

Nature: Corneal ulcer, right eye - 2 o'clock, cornea.

Time Lost: 2 weeks, 3 days

Compensation: \$ 40.50

Name: Pete E. Oquist Date: December 30, 1948.

Cause: Oquist was standing on bottom of ore pocket. As he turned around, he struck his left elbow on scaffold bracing. Felt sharp pain for about one minute.

Nature: Hemarthrosis left elbow, with hemorrhage into the bursa about the elbow.

Time Lost: 1 Week - 5 Days

Compensation: \$ 22.50

HILL-TRUMBULL MINE  
ANNUAL REPORT  
YEAR 1949

14. PROPOSED NEW CONSTRUCTION:

Construction of the conveyor and its attendant facilities has been covered elsewhere, as has been installation of the pit screening plant feeder. Other than this, there has been no new construction and none is planned for the immediate future.

15. EQUIPMENT RECEIVED AND PROPOSED NEW EQUIPMENT:

During the year, the following new equipment was received at the mine:

- 110 ft. 13 " Elevator belt
- 100 ft. 24" Conveyor belt
- 525 ft. 30" Conveyor belt - (for stockpile belt)
- 310 ft. 24" Conveyor belt - (for surge pile)
- 15 H. P. Motor
- 48" Crockett Magnetic Separator
- Bucket Elevator - (In washing plant)
- Enlarging 5'x14' Screen -
- Enlarging two 4'x16' Screens
- Enlarging two 4'x 7' Screens
- Enlarging 5' x 6' Screen
- 2 - Pioneer Conveyors, (in Retreat Plant)
- Allis-Chalmers Tractor - Model HD-19
- 7-1/2 H.P. Lathe Gear Shift Drive
- 42" Apron Feeder - (in Retreat Plant)
- 7 x 16 Hardinge Classifier
- 2 - Speed Reducers
- 60 H. P. Motor
- 5' x 14' Double-Deck Low-Head Screen
- 6 x 6 Single-Deck Low-Head Screen
- Power Hack Saw
- 40 H. P. Gear Motor
- 2 - Switch Panels
- 8 x 6 CWG Pump - (for Spirals)
- Speed Reducer
- 6" Type "T" Frame 190S Pump (for Spirals)
- Second-hand Pan Conveyor - (for Pit)

Proposed New Equipment:

- 1,800 ft. 30" Crude Ore Conveyor
- 3 - 22-ton Euclid Trucks
- 1 - Austin-Western Grader
- 1 - 48" Magnetic Separator
- 1 - 5' x 14' Triple-Deck Screen
- 1 - Merrick Scale
- 1 - 500' Rock Reject Conveyor
- 2 - Portable Stackers



HOLMAN-CLIFFS MINE  
ANNUAL REPORT  
YEAR 1949

1. GENERAL:

At the Holman-Cliffs Mine there were 19 weeks of inactivity in pit operations during the year 1949. Upon completion of one stripping program on January 22nd, there was an 11-week idle period until April 11th, when a new stripping program was started and continued concurrently with ore production until the first of October, when a strike was called, which was of six weeks duration. The strike was settled too late for further ore production, but stripping was again resumed and the second program was completed with another two weeks of pit inactivity prior to the close of the year.

The 1949 ore shipments were started on March 28th with the loading of Brown #2 concentrates from the stockpile, which was loaded to completion by the 18th of April. Again, in the fall, from the new stockpile accumulated during the ore season, partial loading was conducted from November 16th to November 22nd.

Mining ore for plant production got underway on the 9th of May, working on a schedule of 5 days per week and 2 shifts per day. The ore movement was from the Brown #2 and Holman leases, with the major production from the former. The season's ore operations were brought to an abrupt close on September 27th, on account of the strike, just about three days short of the production scheduled.

Washing plant production was conducted on the same schedules established for the pit. The newly-erected heavy density addition to the plant did not get well underway until about a month after washing was started, due to necessary adjustments and revisions. On the whole, however, the plant production accelerated well ahead of schedule, with very few mechanical delays, except for the bottleneck in pipelines and pumps of tailings disposal created by the increase in water consumption and increased production. Intermittent shortages of railroad cars entailed the stockpiling of concentrates, some of which was reloaded during the season at intervals of heavy boat requirements.

The start of operations at the fine ore plant was delayed for lack of water supply pumps and, also, a wash-out of the railroad spur, and did not get underway until May 23rd. The 3-shift per day and 5-day per week schedule was in effect and by September 28th, the enriched area of the old tailings basin was mined to completion. The small tonnage remaining in stockpile from the previous year was loaded out in the spring and the small amount accumulated during the season was reloaded and shipped out with the close of operations.

The stripping program (E&A MC-137) was carried forward from 1948 on a 20-shift per week basis and completed on January 22nd. A new program, (E&A MC-148), was started on April 11th on a 15-shift

HOLMAN-CLIFFS MINE  
ANNUAL REPORT  
YEAR 1949

1. GENERAL:  
(Continued)

per week basis and continued concurrently with ore operations until terminated by the strike on September 30th. With the settlement of the strike, the stripping was again resumed on the same schedule until the first of December, when operations were stepped up to 20 shifts per week, completing this program on December 18th. The major portion of the overburden removed was from the north side rock area of the Brown #2, with smaller amounts from the south side, involving both the Holman and Brown #2 leases.

Exploratory drilling was carried on throughout the year. The Holman-Cliffs drill was stopped during the strike, but the Schultze contract rig, which started at the Holman on the first of September, was permitted to drill through the strike period. The drilling was conducted in both the Brown #2 and Holman forties to probe the possibilities of north and south pit extensions.

Repairs to equipment were conducted throughout the year, except for the six-week strike duration.

Most of the construction work took place in or about the washing plant. The erection of the heavy density plant, (E&A MC-114), started in 1948, was completed in May, and a bank of 44 Humphrey spirals, (E&A MC-144), was installed in the washing plant. The pit service garage, (E&A MC-121), erected in the pit late in 1948, had equipment installations completed by June. A new pumphouse was erected in the pit for east-end drainage. On E&A MC-152, about 200 feet of 24-inch culverts were laid under the highways and railroads, preparatory to stringing out 8,400 feet of new 18-inch tailings line to replace the inadequate 14-inch line. All the old pipe was picked up, and the relaying of the new pipe was well underway at the close of the year.

2. PRODUCTION,  
SHIPMENTS &  
INVENTORIES:

a. Production by Grades:

Holman Crude, -----	84,844 tons
Brown Crude, -----	436,755 "
Holman Retreat Crude, -----	104,857 "
Brown Retreat Crude, -----	445,772 "
 Total Crude, -----	 1,072,228 "
Mesaba-Cliffs Fines Crude, -----	271,299 "
 Grand Total, -----	 1,343,527 "



HOLMAN-CLIFFS MINE  
ANNUAL REPORT  
YEAR 1949

2. PRODUCTION,  
SHIPMENTS &  
INVENTORIES:  
(Continued)

a. Production by Grades: (cont'd)

Holman Bessemer Concentrates, -----	9,618	tons	1.57
Holman-Non-Bessemer Concentrates, -----	41,938	"	5.9
Brown Bessemer Concentrates, -----	43,976	"	6.2
Brown Non-Bessemer Concentrates, -----	231,382	"	32.7
Holman Retreat Bessemer Concentrates, -----	21,418	"	3.0
Holman Retreat Non-Bessemer Concentrates, -----	36,550	"	5.2
Brown Bessemer Retreat Concentrates, -----	49,136	"	6.9
Brown Non-Bessemer Retreat Concentrates, -----	190,457	"	26.9
	<u>624,475</u>	"	
Mesaba-Cliffs Bessemer Fines, -----	49,125	"	6.9
Mesaba-Cliffs Non-Bessemer Fines, -----	34,156	"	4.8
	<u>707,756</u>	"	100.5%

b. Shipments:

Holman Bessemer Concentrates, -----	9,618	"
Holman-Non-Bessemer Concentrates, -----	41,938	"
Brown Bessemer Concentrates, -----	43,976	"
Brown Non-Bessemer Concentrates, -----	278,990	"
Holman Bessemer Retreat Concentrates, -----	21,417	"
Holman Non-Bessemer Retreat Concentrates, -----	36,550	"
Brown Bessemer Retreat Concentrates, -----	49,136	"
Brown Non-Bessemer Retreat Concentrates, -----	159,042	"
	<u>640,667</u>	"
Mesaba-Cliffs Bessemer Fines, -----	49,125	"
Mesaba-Cliffs Non-Bessemer Fines, -----	34,744	"
	<u>724,536</u>	"

c. Inventories:

The Brown stockpile of 54,619 tons at the start of 1949, was shipped out during the year, and a new balance of 38,426 tons was left for the 1950 season.

HOLMAN-CLIFFS MINE  
ANNUAL REPORT  
YEAR 1949

2. PRODUCTION,  
SHIPMENTS &  
INVENTORIES:  
(Continued)

d. Production by Months:

(1) Crude Ore

	HOLMAN WASH	HOLMAN RETREAT	BROWN WASH	BROWN RETREAT	MESABA- CLIFFS FINES	TOTAL
May	18,526	4,147	117,345	-	10,202	150,220
June	7,852	46,405	97,803	82,637	61,091	295,788
July	29,311	28,691	57,429	109,885	60,272	285,588
August	29,155	16,371	87,594	114,590	73,361	321,071
September	-	9,243	76,584	138,660	66,373	290,860
Total,	84,844	104,857	436,755	445,772	271,299	1,343,527

(2) Concentrates

April			1,935		383	2,318
May	11,059	2,616	77,188		2,416	93,279
June	4,785	26,050	59,548	39,566	14,224	144,173
July	17,536	15,655	37,103	58,901	19,262	148,457
August	18,176	8,982	55,482	68,489	22,573	173,702
September	-	4,665	44,102	72,637	24,423	145,827
Total,	51,556	57,968	275,358	239,593	83,281	707,756

f. Ore Statement:

The 54,619 tons of Brown concentrates and the 588 tons of Mesaba-Cliffs Fines, remaining in stockpile at the close of 1948, were both loaded and shipped to completion in the spring, prior to the 1949 ore season. During the ore season, a total of 72,947 tons of concentrates was stocked, of which 20,615 tons were reloaded and shipped during the season and 13,906 tons were shipped post-season, leaving a balance of 38,426 tons of Brown concentrates in stockpile for early 1950 shipment. A total of 985 tons of Mesaba-Cliffs Fines were accumulated in stockpile during the season, but were reloaded and shipped before the close.

3. ANALYSIS:

a. Tonnage and Analysis of Crude Ore:

	Tons	Iron	Phos.	Silica
Holman Wash,	84,844	41.96	.041	34.64
Holman Retreat,	104,857	41.49	.039	35.27
Brown Wash,	436,755	43.48	.047	31.83
Brown Retreat,	445,772	40.24	.039	36.89
Total,	1,072,228	41.82	.043	34.49
Mesaba-Cliffs Fines,	271,299	39.26	-	40.02
Grand Total,	1,343,527	41.31	.043	35.61



HOLMAN-CLIFFS MINE  
ANNUAL REPORT  
YEAR 1949

2. PRODUCTION,  
SHIPMENTS &  
INVENTORIES:

(Continued) b. Tonnage & Analysis of Concentrates Produced:

	Tons	Iron	Phos.	Silica	Mang.	Alu.	Moist.	Iron Nat.
Holman Bess. Conc.	9,618	56.26	.036	12.94	.18	.43	6.92	52.37
Holman N.B. Conc.	41,938	56.39	.056	11.92	.17	.43	6.84	52.53
Brown Bess. Conc.	43,976	56.26	.035	13.56	.22	.42	5.81	52.99
Brown N.B. Conc.	231,382	56.48	.061	11.34	.21	.45	7.97	51.98
Hol.Bess. Ret.Conc.	21,418	56.18	.035	13.39	.21	.40	6.82	52.35
Hol.N.B. Ret.Conc.	36,550	56.49	.059	11.83	.19	.44	7.77	52.10
Brown Bess.Ret.Conc.	49,136	56.79	.038	12.80	.16	.39	7.15	52.73
Brown N.B.Ret.Conc.	190,457	56.77	.057	11.43	.19	.41	7.61	52.45
1949 Production,	624,475	56.56	.054	11.81	.20	.43	7.50	52.32
Mesaba-Cliffs Bess. Fines,	49,125	58.42	.029	12.24	.23	.44	7.87	53.82
Mesaba-Cliffs N. B. Fines,	34,156	58.47	.030	12.32	.23	.44	7.54	54.06
Total Fines	83,281	58.44	.029	12.27	.23	.44	7.74	53.92
	707,756	56.78	.051	11.86			7.53	52.50

c. Tonnage & Analysis of Concentrates Shipped:

Holman Bess.Conc.	9,618	56.26	.036	12.94	.18	.43	6.92	52.37
Holman N.B. Conc.	41,938	56.39	.056	11.92	.17	.43	6.84	52.53
Brown Bess. Conc.	43,976	56.26	.035	13.56	.22	.42	5.81	52.99
Brown N. B. Conc.	278,990	56.40	.058	11.66	.20	.43	7.77	52.02
Hol.Bess.Ret.Conc.	21,417	56.18	.035	13.39	.21	.40	6.82	52.35
Hol. N.B.Ret.Conc.	36,550	56.49	.059	11.83	.19	.44	7.77	52.10
Brown Bess.Ret.Conc.	49,136	56.79	.038	12.80	.16	.39	7.15	52.73
Brown N.B.Ret.Conc.	159,042	56.82	.058	11.39	.19	.41	7.66	52.47
1949 Shipments,	640,667	56.52	.054	11.91	.19	.42	7.46	52.30
Mesaba-Cliffs Bess. Fines	49,125	58.42	.029	12.24	.23	.44	7.87	53.82
Mesaba-Cliffs N.B. Fines	34,744	58.48	.030	12.31	.23	.44	7.54	54.07
Total Fines Shipped	83,869	58.45	.030	12.27	.23	.44	7.74	53.93

d. Mine Analysis of Ore in Stockpile:

Brown Wash Conc.	7,011	56.44	.058	11.61	.19	.41	7.75	52.07
Brown Ret. Concs.	31,415	56.53	.054	11.65	.18	.42	7.34	52.38
Total Stockpile	38,426	56.51	.055	11.64	.18	.42	7.41	52.32

HOLMAN-CLIFFS MINE  
ANNUAL REPORT  
YEAR 1949

2. PRODUCTION,  
SHIPMENTS &  
INVENTORIES:  
(Continued)

e. Complete Analysis of Season's Shipments:

	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alu.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss</u>
Holman Bess. Concs.	56.26	.036	12.94	.18	.43	.27	.17	.010	5.40
Holman N. B. Concs.	56.39	.056	11.92	.17	.43	.26	.17	.011	6.21
Brown Bess. Conc.	56.26	.035	13.56	.22	.42	.27	.16	.011	4.74
Brown N. B. Conc.	56.40	.058	11.66	.20	.43	.26	.17	.010	6.41
Holman Bess. Ret. Conc.	56.18	.035	13.39	.21	.40	.27	.16	.011	5.06
Holman N.B. Ret. Conc.	56.49	.059	11.83	.19	.44	.26	.17	.010	6.11
Brown Bess. Ret. Conc.	56.79	.038	12.80	.16	.39	.26	.17	.011	4.85
Brown N. B. Ret. Conc.	56.82	.058	11.39	.19	.41	.25	.17	.011	6.12
Mesaba-Cliffs Bess. Fines	58.42	.029	12.24	.23	.44	.26	.17	.010	2.95
Mesaba-Cliffs N.B. Fines	58.48	.030	12.31	.23	.44	.27	.18	.010	2.78

4. ESTIMATE OF  
ORE RESERVES:

a. Developed Ore:  
Factors:

	<u>Cu. Ft.</u> <u>Per Ton</u>	<u>Rock</u> <u>Deduction</u>	<u>%</u> <u>Recovery</u>
Merch. Ore	14	-	100.00
Wash Ore	14		58.63
Lean Wash Ore	14		47.80
Low Grade Wash Ore	14		58.58
Lean Low Grade Wash Ore	14		45.06
Retreat Ore	14		40.00



HOLMAN-CLIFFS MINE  
ANNUAL REPORT  
YEAR 1949

4. ESTIMATE OF  
ORE RESERVES:

a. Developed Ore: (cont'd)

	<u>Reserve</u> <u>12-31-48</u>	<u>Mined</u> <u>1949</u>	<u>Balance</u> <u>After</u> <u>Mining</u>	<u>Changed by</u> <u>Re-estimate</u>	<u>Reserve</u> <u>12-31-49</u>
<u>North Star</u>					
N $\frac{1}{2}$ -NE $\frac{1}{4}$ 21,56-24	666,564	-	666,564 /	291,863	958,427
<u>Bingham:</u>					
NW $\frac{1}{4}$ -SE $\frac{1}{4}$ 12,56-24	911,764	-	911,764 /	774,700	1,686,464
<u>Holman:</u>					
SE-NE 21,56-24	2,129,363	109,523	2,019,840 /	400,554	2,420,394
<u>Brown No.1:</u>					
SW-NE 21,56-24	575,829	-	575,829 /	286,213	862,042
<u>Brown No.2:</u>					
SW-NW 22,56-24	2,335,773	514,951	1,820,822 /	2,677,069	4,497,891
<u>Grand Total,</u>	6,619,293	624,474	5,994,819 /	4,430,399	10,425,218

b. Prospective Ore:

The above reserve estimate of 10,425,218 tons represents a complete and new estimate on this property of ores which are available and can be treated at the Holman under present methods. It is doubtful if any additional ore will be developed within the next two or three years. However, in the future, it is very possible that some additional retreat ore will be developed in the extreme north end of both of the North Star forties. It is also possible that some additional ore might later be developed in the northeast corner of the Brown #2 and along the East side of the Bingham. This will all result from progress we are now making in improving beneficiation methods.

c. Estimated Analysis of Ore Reserves:

	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mn.</u>	<u>Alu.</u>
<u>North Star-Bingham:</u>						
Non-Bess. Direct,	67,728	58.00	.051	11.82		
Bess. Wash Conc.	768,778	59.60	.031	10.28	.18	.50
Non-Bess. Wash Conc.	722,173	58.21	.056	10.39	.23	.59
Bess. Retreat Conc.	413,922	57.82	-	11.22	-	-
Non-Bess. Retreat Conc.	672,290	57.84	-	11.10		
<u>Total North Star-Bingham,</u>	2,644,891	58.45	.045	10.68	.20	.54
<u>Holman-Brown:</u>						
Bess. Wash Conc.	2,392,222	58.98	.029	10.28	.17	.43
Non-Bess. Wash Conc.	1,568,533	57.82	.062	10.05	.19	.57
Bess. Retreat Conc.	2,027,685	57.18	-	11.81	-	-
Non-Bess. Ret. Conc.	1,791,887	56.85	-	11.67	-	-
<u>Total Holman-Brown,</u>	7,780,327	57.79	.042	10.95	.18	.49
<u>Total Direct,</u>	67,728	58.00	.051	11.82	-	-
<u>Total Bess. Wash Conc.</u>	3,161,000	59.13	.030	10.28	.17	.45
<u>Total Non-Bess. Wash Conc.</u>	2,290,706	57.94	.061	10.12	.20	.57
<u>Total Wash Concs.</u>	5,451,706	58.63	.043	10.21	.18	.50

HOLMAN-CLIFFS MINE  
ANNUAL REPORT  
YEAR 1949

4. ESTIMATE OF ORE RESERVES:  
(Continued)

c. Estimated Analysis of Ore Reserves: (Cont'd)

	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mn.</u>	<u>Al.</u>
Total Bessemer						
Retreat Concentrates,	2,441,607	57.29	-	11.71	-	-
Total Non-Bessemer						
Retreat Concentrates,	2,464,177	57.12	-	11.51		
Total Retreat Concts.	4,905,784	57.20	-	11.61	-	-
Total Bessemer,	5,602,607	58.33	.030	10.90	.17	.45
Total Non-Bessemer,	4,822,611	57.52	.060	10.85	.20	.57
Grand Total,	10,425,218	57.96	.044	10.88	.18	.50

5. LABOR & WAGES:

a. Comments:

The supply of labor was ample throughout the year, although the return of employees recalled after a shutdown was slow at times, especially after the strike, which ended during the local deer season, when many employees were out in the woods. The strike itself was very orderly in which picket lines were mostly non-existent.

b. Comparative Statement of Production & Wages:

Production:

Wash Concentrates,	624,475 tons
Mesaba-Cliffs Fines,	83,281 "
Total,	707,756 "

Number of Days Operated	103
Average number of men working	173
Average Wages per day	\$ 12.10
Product per man per day	25.75
Labor cost per ton	.470
Total number of days	27,486
Amount paid for labor	\$ 332,624.28

6. SURFACE:

a. Buildings, Repairs:

A total of \$16,789.09 was expended during the year in the maintenance of the office, shops, and the 58 rented houses in Taconite. The expenditures were made in foundation repairs, exterior painting, and normal maintenance work.



418

HOLMAN-CLIFFS MINE  
ANNUAL REPORT  
YEAR 1949

6. SURFACE:  
(Continued)

b. Roads, Transmission Lines, etc:

Outside of the constant shifting and rebuilding of roads incidental to pit and dump development, no new outlying roads were constructed during the year, although road maintenance was quite extensive with stripping operations on both the north and south sides of the pit, in addition to roads necessary for ore operations.

A new substation was erected on the south side of the pit, with about 2,800 feet of new transmission line for a more uniform distribution of power to offset the additional load entailed by the heavy density plant installation.

c. Miscellaneous General Construction:

Early in the year, about 800 feet of 16-inch line was hooked up over the east edge of the pit to complete the new east-end drainage plans, and, prior to ore operations, about 1,700 feet additional was branched off the east-end discharge and connected to the lake-to-plant reservoir line to use the pit water for plant requirements. The pit-to-plant discharge was completed just in time to supply water for the start of plant operations, which would otherwise have been delayed because the Hill Lake pumphouse and pumps were destroyed by fire for a total loss on April 27th.

A new pumphouse was erected immediately and a pump was shifted from the fine ore plant, which, however, delayed the start of fine ore operations somewhat. At the close of the year, a storage shed was built adjacent to the washing plant and was completed, except for the interior shelving and floors.

7. OPEN PIT:

a. Stripping:

The stripping operations conducted during the year were made up partly of E&A program (MC-137), which was started in 1948, and a new program, E&A MC-148, both of which were completed in 1949. A grand total of 1,316,924 cubic yards of overburden was removed, of which 1,140,664 yards were from the Brown #2 and 176,260 yards from the Holman lease.

The first stripping program was carried forward from 1948 on a 20-shift per week basis and completed on January 22nd. Practically all this stripping was from the taconite horizon on the north side of the Brown #2 forty. On 60 shifts of operation, a total of 162,332 cubic yards of the blocky overburden was removed. Two shovels were used during this period, and an average movement of 2,706 yards per shift was realized at a cost of \$0.410 per yard. Drilling was slow in the hard taconite and considerable delays were encountered, due to adverse weather conditions. During snow or sleet storms the bottom dump trucks did not have traction to negotiate the grades and crews were trimmed for a single-shovel oper-

HOLMAN-CLIFFS MINE  
ANNUAL REPORT  
YEAR 1949

7. OPEN PIT:

a. Stripping: (continued)

ation. During extreme cold periods of 30 below zero, a trip motor arm and dipper bale broke on the 120-B Shovel #57, and the dipper sticks and a bale broke on the Marion Shovel No. 69 for a complete shutdown of operations for a 24-hour period.

During the 11-week period of shutdown, after the winter stripping, about a month of drilling was carried on with two drill crews in the hard taconite, preparatory to the resumption of stripping operations in the spring.

Following the spring breakup, a new stripping program was started on April 11th, on a 3-shift per day and 5-day per week basis. The same stripping schedule was carried on throughout the ore season to the beginning of the strike on October 1st. Following the six-week strike period, stripping was resumed on the 15-shift per week basis until December 1st, when a 20-shift week was effected to speed up the program which was then completed on December 18th. This stripping was conducted mainly in the taconite area with some additional extensions into the surface material on the north side of Brown #2 and in the narrow area along the south side, where smaller amounts of waste formation and surface were removed from both the Brown #2 and Holman forties. On 456 shifts of operation, a total of 1,154,592 cubic yards of overburden was removed, showing an average movement of 2,532 yards per shift at a cost of \$0.331 per yard. Drilling and blasting costs were comparatively high, but this was anticipated in view of the large proportion of hard taconite handled. Otherwise, considering the additional wear created by this blocky material on shovels, trucks, and tires, the final costs were not bad. Single-shovel operations were conducted mainly throughout this program, except on the third shift during ore operations, when it was not necessary to sort lean materials from the ore areas, the second shovel supplemented stripping operations. With a spare shovel available most of the time, very few shovel delays were encountered. However, ore production was always favored in truck requirements, and, during periods of increased demands for more rock haulage in the screening or sorting of ore, stripping operations were stunted for trucks. About six additional shifts were lost to production during this program when crews were recruited off the job for two shifts around the last of April, to fight forest fires, three shifts in equipment preparations before and after the strike, and one shift curtailment in December, due to icy roads.

The combined total of 1,316,924 cubic yards of overburden was removed during the year at an average rate of 2,552 yards per shift at a cost of \$.341 per yard. Tabulations below show the breakdown of material stripped, by leases:



HOLMAN-CLIFFS MINE  
ANNUAL REPORT  
YEAR 1949

7. OPEN PIT:  
(Continued)

a. Stripping: (continued)

	<u>Surface</u>	<u>Waste</u>	<u>Retreat</u>	<u>Lean Ore</u>	<u>Paint Rock</u>	<u>Taconite</u>	<u>Total</u>
Brown #2	218,992	50,151	8,873	115,283	97,311	650,054	1,140,664
Holman	34,818	27,733	3,717	29,225	20,984	59,783	176,260
Total,	253,810	77,884	12,590	144,508	118,295	709,837	1,316,924

b. Open Pit Mining:

The 1949 ore season was started on May 9th, and single-shovel operations were conducted on a 2-shift, 5-day per week schedule until September 27th, when operations were stopped and equipment was prepared for storage for the strike duration. On 204 shifts of ore operations, a total gross crude of 1,155,178 tons was moved at an average rate of 5,663 tons per shift at a mining cost of \$.214 per ton. Of the gross crude, 82,950 tons of rock were scalped at the screening plant and hauled out of the pit, leaving a net crude to the mill of 1,072,228 tons, reflecting an average mill feed of 5,256 tons per shift. The proportions of net crude, by leases, was 882,527 tons from the Brown #2 and 189,701 tons from the Holman. The split on Brown crude was 436,755 tons of wash ore and 445,772 of retreat, while the Holman was 84,844 of wash and 104,857 tons of retreat.

Most of the Brown #2 production was from the newly-stripped area along the north side, with a smaller tonnage mined off the bottom, west of the sump, for an average depth of about 12 feet. A small amount of Holman production was from the upper benches of the south side, but the main tonnage was off the pit bottom, which was lowered about an average of 20 feet and at a slight grade to maintain the easterly flow for drainage. Single-shovel operations were used during the season, except for short intervals while completing or starting new cuts when a second shovel was operated temporarily to maintain production. Dependent on the length of haul, 6 to 8 trucks were used for ore haulage, although during periods of heavy rock rejection at the screens, it was necessary to supplement the fleet with an additional truck or two.

Several shovel breakdowns were encountered during the season, but a spare shovel was always substituted, and, outside of the short time lost in the shifting of crews or moving in another shovel, very little delay time developed. Operations were retarded considerably, however, during the first half of July, due to a series of extremely heavy rains over the 4th of July week-end. Floods from the north overflowed a 30-inch culvert on the north side of the pit and washed out the north pit approach and several benches, scattering gravel and debris over the entire pit bottom. The water rose over 14 feet

HOLMAN-CLIFFS MINE  
ANNUAL REPORT  
YEAR 1949

7. OPEN PIT:  
(Continued)

b. Open Pit Mining: (continued)

in a few hours and considerable clean-up work and rebuilding of haulage roads was necessary for the continuation of ore operations.

Due largely to the flood, some 17,032 cubic yards of sloughed material was cleaned up and sorted out of the ore areas. In addition, a total of 24,268 tons of other material was sorted out, consisting of 14,709 tons of pit rock and 9,559 of lean material. The clean-up and lean materials were hauled out of the pit to the respective dumps on the north side, and the total movement entailed an additional cost of \$.015 per ton of concentrate produced.

c. Pumping and Drainage:

In March, about 800 feet of 16" pipeline was installed up the east banks of the pit for the new east-end drainage. The bottom pumphouse and raft were moved to the east end and the secondary pumps were installed at the intermediate sump. Subsequently, the 16-inch pipe released by the new hook-up was relaid as a branch from the east end discharge and connected to the Hill Lake reservoir line to supplement the plant requirements. About 1,700 feet of line was involved in the auxiliary and was completed prior to ore production. In the bottom sump, the water elevation was maintained at about the 440 elevation and the discharge averaged about 2,000 gallons per minute, with extreme variations between wet and dry periods. The sump was not lowered during the season, but both sumps were clammed out several times after rainy spells. Pumping and drainage costs amounted to \$.022 per ton of final product.

d. Other General Pit Activities:

During the 6-week period of the strike, from October 1st to November 16th, all operations were at a standstill; however, salaried employees were retained, and pumpmen and firemen were permitted to carry on their work. About \$18,000.00 was expended in overhead salaries and wages during the period, which was charged to Winter and Idle Expense. Also compiled during the strike was about \$22,000.00 in materials and supplies which were not incurred by the strike itself, but were charged to Winter and Idle during the period of inactivity.

8. BENEFICIATION:

a. Washing Plant:

The washing plant operated on schedules established for the pit, from May 9th to September 27th. On 204 shifts of operation, a total of 1,072,228 tons crude ore was mined to produce 624,475 tons of concentrates, showing a combined weight recovery of 58.24 percent and an average rate of production of 3,061 tons per shift. The wash crude portion of 521,599 tons produced 326,914 tons of



HOLMAN-CLIFFS MINE  
ANNUAL REPORT  
YEAR 1949

8. BENEFICIATION:  
(Continued)

a. Washing Plant: (continued)

product with a recovery of 62.68 percent, while the 550,629 tons of retreat crude produced 297,561 tons at an average of 54.04 percent recovery. Of the 297,561 tons of retreat concentrates, only 133,986 tons were beneficiated by the heavy density process. The balance of 163,575 tons was the minus 1/8" material concentrated through the washing plant classifiers only.

The washing plant proper, operated quite satisfactorily throughout the season, except for the bottleneck created in tailings disposal, due to increased production and additional water requirements, and some retarded feed during the flood period in July. The new heavy density plant was tried out in May, but numerous difficulties were encountered in maintaining a uniform suspension and proper balance of heavy media throughout the circulation system. Alterations were made on surge pumps and pipelines, reducing the speed of recirculation for a more uniform distribution of the ferro-silicon, and the overflow weirs of the 78" separators were rebuilt on the opposite sides for a freer discharge of the float material. The punched-hole drain screens were replaced with wedge-bar decking to eliminate the blinding and subsequent excess loss of heavy media. With several other minor alterations, the retreat plant got underway early in June and very good results were obtained thereafter, and operating delays decreased to a minimum. A bank of 44 spirals and a hydrosizer were installed in the plant during the spring, to recover the iron values from the tailings. This new installation was put into operation several times, but the additional water required aggravated further the tailings disposal problems, and was finally discontinued until the inadequate 14-inch tailings line could be replaced with 18-inch line.

The accumulation of washing plant delays amounted to a total of 72 hours for the entire season. Of the total, about 34 hours were lost to production, due to the restriction of the 14-inch tailings line. On the 21st of June, about 3,000 feet of the line plugged solid with tailings, delaying operations for ten hours. Subsequently, a third tailing pump was installed along the line as a booster to increase the speed of flow, but, during warm spells, the pump motors kicked out frequently, which comprised the remaining portion of the tailing delays. About 16 hours were lost to periods of no crude to the plant, consisting of intervals of shovel repairs or moves for changes in grade requirements and other interruptions to pit operations, especially during the flood period in July. The remaining 12 hours of the total, consisted of minor repairs to various plant equipment, power failures and delays incurred by railroad service. After the initial alterations and the retreat plant got underway in June, less than a six-hour total in delays were accumulated during

HOLMAN-CLIFFS MINE  
ANNUAL REPORT  
YEAR 1949

8. BENEFICIATION:  
(Continued)

a. Washing Plant: (continued)

the season, the largest item entailing 3 hours in sprocket failures on the feed conveyors. Lesser alterations were made throughout the season, however, but switches to wash ore operations during the remodeling periods obliterated the potential delays.

Compiled below are the tonnages and analyses of the various mill rejects and products:

5' x 14' Screen Rejects

<u>Lease</u>	<u>Tons</u>	<u>Iron</u>
Holman,	4,840	27.50
Brown,	32,490	28.22
Total,	<u>37,330</u>	<u>28.13</u>

The rock removed from the pit was as follows:

<u>Lease</u>	<u>Tons</u>	<u>Iron</u>
Holman,	558	20.80
Brown,	14,151	22.16
Total,	<u>14,709</u>	<u>22.11</u>

The concentration data for the Holman-Cliffs for the year 1949 was as follows:

	<u>Tonnage</u>	<u>Iron</u>	<u>Tonnage Recovery</u>	<u>Iron Unit Recovery</u>	
Mes. Fines Crude to Mill,	278,465	36.29			
Fines Produced,	87,006	58.68	31.25	50.52	
	<u>Tonnage</u>	<u>% Total Mined</u>	<u>% Iron Dried</u>	<u>Tonnage Recovery</u>	<u>Iron Unit Recovery</u>
Crude ore and rock mined	573,638	100.00	41.71		
Less: Rock removed in mining	14,709	2.56	22.11		
Crude ore transported to mill	558,929	97.44	42.22		
Less: Rock rejects in Sc.Plt.	37,330	6.51	28.13		
Crude ore entering mill,	521,599	90.93	43.23		
Concentrates Produced	326,914	56.99	56.44	62.68	81.83
Tailings (by deduction)	194,685	33.94	21.05		



HOLMAN-CLIFFS MINE  
ANNUAL REPORT  
YEAR 1949

8. BENEFICIATION:  
(Continued)

b. Fine Ore Plant:

The reclamation plant got off to a slow start on May 23rd, due to a washout of the railroad spur and inadequate water supply, but after the difficulties were overcome, progress accelerated and the entire enriched area within the protective dykes was mined out to completion by September 28th. Working on a weekly schedule of 5 days of 3 shifts each, a total of 271,299 tons of crude ore was treated to produce 83,281 tons of concentrates, showing a weight recovery of 30.70 percent. The feed to the plant averaged 962 tons of crude per shift with an output of 295 tons per shift. Just prior to the ore season, a necessary substitution was made on water supply pumps, due to the fire at the Hill Lake pumphouse. Consequently, the fine ore plant was starved for water and production was below normal until the latter part of June, when new sheaves were installed in the pump and the rate of feed increased and was maintained well over the estimated 1,000 tons per shift.

Because of the radial cuts required to excavate the remaining ore, shifting of the field conveyors, hopper and dragline was more frequent than in 1948 when cuts were more oblong in shape. Furthermore, a larger portion of the outlying painty fines were handled which jeopardized considerably the operations of the hydroseparator, by settling to the bottom of the tank in sticky masses and stopping other operations until the painty material could again be slowly raked into suspension.

About 300 hours were lost to production during the operating season; however, about a third of the non-production time was entailed by conveyor and hopper moves, and starting and flushing out for week-ends, which are stoppages normal to the set up, but not true delays. The largest individual source of delay was the plugging of the hydroseparator which accumulated a total of 67 hours. Pump alterations and repairs ran about 20 hours, while delays due to plugged screens and repairs amounted to 13 hours. About 11 hours were accumulated against railroad car service and track delays. Running repairs to the dragline for the season totaled 39 hours.

In addition to the 12,540 tons of borderline fines stocked near the field conveyors in the fall of 1948, an additional 15,525 tons of isolated material was hauled into working range with Terra Cobra self-loaders in April of 1949, all of which was loaded out during the season. The isolated area excavations included part of the original dyke, and about 1,200 feet of new dyke was constructed with the 54-B dragline prior to the ore operations, involving a total expenditure of about \$3,000.00 for the portion reclaimed in 1949. An additional extra expenditure was about \$2,000.00 for a 100-foot extension to the main field conveyor, installed during the operating season.

HOLMAN-CLIFFS MINE  
ANNUAL REPORT  
YEAR 1949

8. BENEFICIATION:  
(continued)

Retreat Plant Data:

Compiled below are the tonnages and analyses of the various mill rejects and products:

Retreat Screen Rejects

<u>Lease</u>	<u>Tons</u>	<u>Iron</u>
Holman,	8,360	28.65
Brown,	<u>37,260</u>	<u>27.82</u>
Total,	45,620	27.97

	<u>Tonnage</u>	<u>% Total Mined</u>	<u>% Iron Dried</u>
Crude ore and rock mined	596,249	100.00	39.52
Less: Rock removed in mining	-	-	-
Crude ore transported to mill	596,249	100.00	39.52
Less: Rock rejects in screen. plant	<u>45,620</u>	<u>7.65</u>	<u>27.97</u>
Crude Ore Entering Mill	550,629	92.35	40.48
Retreat Concentrates Produced	297,561	49.91	56.69
Tonnage Recovery	54.04		
Iron Unit Recovery	75.68		
Retreat Rejects	42,606	7.15	39.41
Tailings (by deduction)	210,462	35.30	17.78

9. MAINTENANCE  
AND REPAIRS:

The washing plant equipment was re-conditioned prior to the ore season, with the necessary supplemental changes entailed by the addition of the new retreat plant. Repairs were started anew after the 1949 season and added installations were started pertinent to the increased supply water and tailings disposal requirements. The shovels received a moderate, but adequate overhaul during the pre- and post-season idle periods. The newer bottom-dump truck repairs were comparatively light, but the end-dump Euclids were thoroughly overhauled. The complete re-conditioning of the end-dumps increased the yearly maintenance costs per hour considerably, but with the resultant increase in truck availability and efficiency in operations, proved economical since operating costs per ton dropped well below those of the previous year. Tractors, graders, and drills received repairs as required to meet their individual needs.



HOLMAN-CLIFFS MINE  
ANNUAL REPORT  
YEAR 1949

10. COST OF  
OPERATION:

a. Comparative Mining Costs:

	1949 Budget Estimate	1949 Cost Per Ton	1948 Cost Per Ton
<u>Product:</u>			
Wash & Retreat Concs.	641,000	624,475	906,799
Fine Ore Concentrates,	75,000	83,281	87,006
Total Concentrates,	<u>716,000</u>	<u>707,756</u>	<u>993,805</u>
 Average Shift Production - (Washing Plant)		 3,061	 2,879
Tons Per Man Per Day - (Washing and Fine Ore Plants)		 25.75	 28.85
Days Operated		103	130
 <u>Cost:</u>			
Fine Ore Concentrates	\$ .818	\$ .766	\$ .646
Open Pit Optg. Crude Ore	.203	.214	.341
Concentrating	.309	.319	.121
General Mine Expense	.159	.164	.122
Winter and Idle Expense	<u>.420</u>	<u>.490</u>	<u>.280</u>
Cost of Production,	<u>\$1.297</u>	<u>\$1.386</u>	<u>\$1.055</u>
Depreciation- Plant Equipment		.174	.166
Depreciation- Motorized Equipment		.047	.130
Depreciation- Movable Equipment		.005	-
Amortization of Stripping		.329	.356
Taxes - Ad Valorem		.278	.124
Taxes - Occupational		.145	.092
Taxes - Royalty		.032	.025
Amortization of Leasehold		<u>.112</u>	<u>.192</u>
Total Cost at Mine,		<u>\$2.508</u>	<u>\$2.140</u>
Administrative Expense		.100	.100
Miscellaneous Expense and Income		<u>.017</u>	<u>.017</u>
Grand Total,		<u>\$2.608</u>	<u>\$2.223</u>

HOLMAN-CLIFFS MINE  
ANNUAL REPORT  
YEAR 1949

10. COST OF  
OPERATION:  
(Continued)

b. Detailed Cost Comparison:

(1) Product

With the development and addition to retreat operations, the 1949 product showed considerable improvement in silica elimination as compared with the previous year's product. The 1949 analysis of natural iron, silica and weight recovery were 52.26%, 11.69% and 58.24%, respectively, where 1948 showed 52.30%, 12.91% and 64.56%. The introduction of the added beneficiation affords less similarity of operations for comparative costs, however.

(2) Open Pit Mining:

The production of crude ore in 1949 was \$.214 per ton, as compared with \$.203 of the budget and \$.341 for 1948. The one cent excess over the budget was due to absorption, in 1949, of a backlog of structural drilling costs. This year indicated a decrease of about 13 cents a ton under the 1948 costs, comprising of a 2-cent saving in Pumping and Drainage, due to the relocation of sumps, and about a 3 cent saving in handling lean materials, due to considerable absorption of such materials in the 1949 retreat operations. The remaining 8 cents per ton savings are indicated in truck and shovel operations, but are not true to that extent since the overhauling costs of these units were charged to Winter and Idle Expense.

(3) Concentrating:

The budget for concentrating was estimated at \$.309 per ton for the combined product and the actual cost amounted to \$.319, showing a net over-expenditure of one cent per ton. The actual washing plant operations showed a saving of one cent per ton, as compared with the budget; however, due to the necessary alterations and the initial charge of ferro silicon to the heavy density plant, the retreat operations developed a 2 cent excess. The 1948 costs for washing alone was \$.121 per ton and was about 3 cents under the 1949 operations, due to additional power requirements and reduced weight recovery entailed by the combined wash and retreat operations of the latter.

(4) General Mine Expenses:

Under this caption, the 1948 cost per ton was \$.124 and, due to the general trend of increasing costs, was budgeted at \$.159. The general trend showed slight increases in all the numerous items under this caption, but Employees Vacation Pay increased more than anticipated, with a resultant 1949 cost of \$.164 per ton, showing a 5-mill increase over the budget.



HOLMAN-CLIFFS MINE  
ANNUAL REPORT  
YEAR 1949

10. COST OF  
OPERATION:  
(Continued)

b. Detailed Cost Comparison: (Cont'd)

(5) Winter and Idle Expense:

This item was \$.280 per ton in 1948 and was estimated at \$.420 in the budget, due to anticipated additional expenditures for the heavy overhaul period and plant revisions entailed by the installation of the spiral and heavy density additions. The actual cost for 1949 was \$.490, reflecting an increase of 7 cents per ton over the estimate. The repair program overran anticipations, due to purchase of a dipper, dipper sticks and regrooving for the circle rails on the shovels, amounting to an additional expenditure of about \$12,000.00, and truck and tractor repairs overran about \$10,000.00, the total of which was more than offset by efficiencies derived during the operating season. Entailed by the new retreat plant and spirals, unforeseen modifications in washing plant chutes, conveyors and provisions for the redistribution of power, developed an additional \$10,000.00 expense. Together with the expense involved by the strike, the accumulation of extra expenditures accounted for more than the 7-cent deficiency.

(6) Fine Ore Concentrates:

The 1948 reclamation of concentrates from the tailings, showed a cost of \$.646 per ton for operations in the most enriched portion of the dyked area. With the 1949 developments scheduled in the outerlying leaner grades with the added expense of reddyking and hauling in some isolated portions, the cost was budgeted at \$.818 per ton. The actual operations involved all the anticipated additional developments, but due to added experience in handling the wet crude and moving conveyors, the 1949 cost was \$.766, reflecting a saving of about 5 cents per ton.

11. EXPLORATION  
AND FUTURE  
EXPLORATION:

During the year, a total of 1,658, 1/2 feet of structural drilling was accomplished, of which 1,330 feet was in the Brown #2 forty and 328-1/2 feet in the Holman. The J. S. Schultze Drilling Contractor drilled 639 feet of the total and 1,019-1/2 feet was drilled with the Company outfit.

Drilling was slow, due to the harder and lower grade materials involved in current operations. Only the Company drill was used until September 1st, when the contractor was moved in to supplement the program. The contractor was allowed to operate throughout the 6-week period of strike, but the Company rig was stopped.

HOLMAN-CLIFFS MINE  
ANNUAL REPORT  
YEAR 1949

11. EXPLORATION  
AND FUTURE  
EXPLORATION:  
(Continued)

Both the north and south sides of the pit were explored but, in general, the explorations showed no improvements in grade, although horizontal interpolations and extensions along the shorelines were verified.

During 1950 it is planned to probe further the northeast extensions of the Brown #2 and establish the shorelines in the North Star and Bingham forties. The drilling program will be stepped up to prove or disprove some optimistic extensions of the tax commission.

12. TAXES:

The following is a statement of the taxes for the years 1949 and 1948:

	1949	1948	Increase	Decrease
Holman-Brown Mine	\$130,466.39	\$ 78,375.16	\$52,091.23	
Bingham Mine	24,018.99	16,308.02	7,710.97	
North Star Mine	11,566.45	8,474.22	3,092.23	
Test Laboratory & Truck Shop,	1,066.25	964.82	101.43	
Washing Plant Site	5,866.65	4,364.19	1,502.46	
Auxiliary & Dump Lands	482.84	510.32		\$27.48
Holman-Cliffs Shops, Office, Fuel Oil Plant and Central Warehouse,	500.58	415.75	84.83	
Holman-Cliffs Personal Property	11,997.75	6,585.31	5,412.44	
Holman-Cliffs Fine Ore Plant	978.12	834.27	143.85	
Holman-Cliffs Tailings Basin Fines, Personal Property Tax	10,208.00	7,221.25	2,987.47	
<b>Total,</b>	<b>\$197,152.74</b>	<b>\$124,053.31</b>	<b>\$73,099.43</b>	
Rented Buildings,	<u>\$ 1,416.82</u>	<u>\$ 1,179.15</u>	<u>\$ 237.67</u>	
<b>Grand Total,</b>	<b>\$198,569.56</b>	<b>\$125,232.46</b>	<b>\$73,337.10</b>	
Average Tax Rate	130.77	117.90	12.87	

The substantial increase in ad valorem taxes for the Holman-Brown, Bingham and North Star Mines is the result of a large increase in reserve tonnage, brought about by a re-estimate and review of these properties by the Tax Commission's engineers.



HOLMAN-CLIFFS MINE  
ANNUAL REPORT  
YEAR 1949

12. TAXES:  
(Continued)

The slight increase for Test Laboratory and Truck Shop is due to the higher tax rate.

The increase for Washing Plant Site is the result of the addition of the heavy density plant.

The higher tax rate accounts for the increase in Holman-Cliffs Shops & Office and Fuel Oil Plant.

The substantial increase in Holman-Cliffs personal property is accounted for by the addition of new equipment.

The Holman-Cliffs Tailings Basin Fines, Personal Property tax is considerably higher due to the increased price for iron ore in 1949.

The increased average tax rate of 130.77 mills for 1949, as compared to 117.90 for 1948, is due largely to increased rates in the County, Township and School District.

13. ACCIDENTS AND  
PERSONAL INJURY:

The accident record showed one compensable accident encountered during the year, involving about five months of lost time. Non-compensable accidents totaled two for an additional 7 days of lost time. The improved record can be credited mainly to the harmony and good cooperation between the safety and operating departments.

14. PROPOSED NEW  
CONSTRUCTION:

Outside of the revised installation for the spiral feed and necessary alterations in plant tailings disposal, no new construction has been contemplated for the immediate future.

15. EQUIPMENT RECEIVED  
AND PROPOSED  
NEW EQUIPMENT:

Itemized below are the new pieces of equipment purchased by the Holman-Cliffs Mine in 1949:

- 3 - 23TD Rear-dump Euclid Trucks
- 1 - D-8 "Caterpillar" Tractor
- 1 - 5-Cu. Yd. Dipper for Marion shovel
- 1 - Miles Milling Machine

HOLMAN-CLIFFS MINE  
ANNUAL REPORT  
YEAR 1949

15. EQUIPMENT RECEIVED  
AND PROPOSED  
NEW EQUIPMENT:  
(Continued)

- 1 - Back Hoe Attachment for Tractor
- 1 - Air Compressor
- 1 - Chisholm-Moore Low-Head Trolley Hoist
- 1 - Westinghouse Switch-house
- 2 - CR-7006 Magnetic Starting Switches
- 2 - 5-Turn Double Humphrey Spirals
- 1 - Johnson Metal Cutting Band Saw
- 2 - 9-inch Screw Conveyors

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On order for 1950 delivery are: 3 additional end-dump Euclid trucks; one D-8 "Caterpillar" tractor; one Model 12 "Caterpillar" grader. Also due for replacement are three 1/2-ton pick-up trucks.

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SARGENT MINE  
ANNUAL REPORT  
YEAR 1949

1. GENERAL:

Mining operations at the Sargent Mine were carried forward from the first of the year to June 27th on a two-shift, six-day a week basis and were then cut back to a two-shift, five-day week for the balance of the year. In addition to time lost on holidays, five days were lost in July, due to floods from severe rain storms. A general strike in the area caused a complete loss of production from midnight of September 30th to 7:00 A.M. November 14th.

An average of thirteen gangs were employed underground and from May 14th through September, a tractor was employed milling ore from the pit. From January 1st to March 25th, ore was placed in stockpile. Direct loading into cars was carried on until November 28th, at which time stockpiling was resumed for the balance of the year. The stockpile was loaded out from March 28th to April 27th.

Upon completion of a study on feasibility of concentrating the high silica ores in this property, an E&A was approved and construction started on a small washing plant for operation in 1950. The E. J. Longyear Company started a structure drill program, drilling from underground, on December 15th.

2. PRODUCTION,  
SHIPMENTS &  
INVENTORIES:

a. <u>Production:</u>		
Sargent, -----		315,341 tons
b. <u>Shipments:</u>		
Sargent, -----		319,819 "
c. <u>Stockpile Inventories:</u>		
Sargent, -----		30,811 "
e. <u>Production by Months:</u>		
January, -----	25,537 tons	
February, -----	24,201 "	
March, -----	25,452 "	
April, -----	36,512 "	
May, -----	42,229 "	
June, -----	48,218 "	
July, -----	24,319 "	
August, -----	30,504 "	
September, -----	30,004 "	
October, -----	-	
November, -----	9,892 "	
December, -----	18,471 "	
Total, -----		315,341 tons

SARGENT MINE  
ANNUAL REPORT  
YEAR 1949

2. PRODUCTION,  
SHIPMENTS &  
INVENTORIES:  
(Continued)

f. Ore Statement:

Ore was loaded from both the milling pit and shaft during the year.

3. ANALYSIS:

b. Tonnage and Analysis of Direct Ore Produced:

	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Mang.</u>	<u>Alu.</u>	<u>Moist.</u>	<u>Iron Nat.</u>
Merch.	315,341	55.28	.058	13.59	.65	1.64	12.73	48.28

c. Tonnage and Analysis of Ore Shipped:

Merch.	319,819	55.23	.058	13.62	.64	1.64	12.65	48.24
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d. Mine Analysis of Ore in Stockpile:

Merch.	30,811	54.97	.060	13.69	.83	1.68	13.26	47.68
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e. Complete Analysis of Shipments:

	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Mn.</u>	<u>Alu.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss</u>
Merch.	55.23	.058	13.62	.64	1.64	.34	.20	.012	4.17

4. ESTIMATE OF  
ORE RESERVES:

a. Factors:

	<u>Cu. Ft. Per</u> <u>Ton Crude</u>	<u>%</u> <u>Recovery</u>
Direct Ore	14	100

b. Ore Reserves:

	<u>Reserve</u> <u>12-31-48</u>	<u>Mined</u> <u>1949</u>	<u>Bal. After</u> <u>Mining</u>	<u>Reserve</u> <u>12-31-49</u>
NW-SE 23,57-22	99,715	-	99,715	99,715
NE-SE 23,57-22	317,772	-	317,772	317,772
SW-SE 23,57-22	537,613	140,349	397,264	397,264
SE-SE 23,57-22	339,457	118,015	221,442	221,442
NW-NE 26,57-22	152,827	56,977	95,850	95,850
Total,	1,447,384	315,341	1,132,043	1,132,043



SARGENT MINE  
ANNUAL REPORT  
YEAR 1949

4. ESTIMATE OF  
ORE RESERVES:  
(Continued)

c. Analysis of Ore Reserves:

	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mn.</u>	<u>Alu.</u>
NW-SE 23,57-22	99,715	57.94	.060	9.80	.88	1.42
NE-SE 23,57-22	317,772	57.94	.060	9.80	.88	1.42
SW-SE 23,57-22	397,264	56.58	.071	10.08	.83	2.53
SE-SE 23,57-22	221,442	56.58	.071	10.08	.83	2.53
NW-NE 26,57-22	95,850	56.58	.071	10.08	.83	2.53
Total,	1,132,043	57.08	.067	9.98	.83	2.12

5. LABOR & WAGES:

a. Comments:

The labor supply was ample throughout the year, but there continued to be a shortage of experienced miners. A program of training available men continued and no serious shortage developed for present operations. Although a general strike occurred in the area, over pensions, local labor relations with the Union were good.

b. Comparative Statement of Production & Wages:

Production:

Direct Ore, -----	315,341 tons
Number of Days Operated, -----	247
Average Daily Product, -----	1,267.7 tons
Average Number of Men Working, -----	108-1/4
Tons Per Man Per Miner, -----	21.11
Tons Per Man Total Underground, -----	13.80
Tons Per Man Total Mine, -----	10.51
Average Rate Per Day:	
Surface, -----	\$ 11.19
Underground, -----	14.26
Contract Miners, -----	15.52
Total Mine, -----	13.67
Amount Paid for Labor, -----	\$413,729.39
Labor Cost per Ton, -----	1.312

6. SURFACE:

a. Buildings, Repairs:

Maintenance repairs to all mine buildings were carried on throughout the year. Only minor maintenance repairs were made on location houses Nos. 6, 7 and 8, but a basement, furnace and general renovation was completed on House No. 5. A total of \$6,707.05 was expended on these houses.

b. Roads, Transmission Lines, etc:

A few small changes in timber yard roads and local transmission lines were made, due to construction of washing plant.