ATKINS MINE
ANNUAL REPORT
YEAR 1948

2. PRODUCTION, SHIPMENTS & INVENTORIES: (Continued)

c. Stockpile Inventories:

As of January 1, 1948, there were in stock at the Atkins Mine 41,890 tons of ore, which was completely loaded out by April 29th. Intermittent stocking and loading was conducted throughout the season and on December 31st, there were 51,558 tons of ore in stockpile.

d. Production by Months:

MONTH:	ATKINS MERRITT	ATKINS EXTENSION LEASE	TOTAL
April,		5,450	5,450
May,	1,928	93,158	95,086
June,	6,080	75,683	81,763
July,	630	71,583	72,213
August,	6,662	70,666	77,328
September,	2,110	64,160	66,270
October,	12,794	53,466	66,260
November,		61	61
December,		19,274	19,274
Total,	30,204	453,501	483,705 ✓

f. Ore Statement:

Ore production continued throughout December, bringing the stockpile balance to 51,558 tons.

3. ANALYSIS:

b. Tonnage & Analysis of Direct Ore Production:

	Tons	Iron	Phos.	Silica	Mang.	Alum.	Moist.	Iron Nat.
Atkins-Merritt,	30,204	46.92	.122	12.73	1.23	8.22	21.81	36.69
Atkins Extension Lease,	453,501	47.80	.131	11.71	1.54	7.31	19.08	38.68
Total,	483,705	47.74	.130	11.78	1.52	7.37	19.25	38.55

c. Tonnage & Analysis of Ore Shipped:

Atkins-Merritt,	30,204	46.92	.122	12.73	1.23	8.22	21.81	36.69
Atkins Extension Lease,	443,833	47.20	.128	11.66	1.50	7.21	20.35	37.60
Total,	474,037	47.18	1.27	11.73	1.48	7.27	20.44	37.54

ATKINS MINE
ANNUAL REPORT
YEAR 1948

3. ANALYSIS:
(Continued)

d. Tonnage & Analysis of Ore in Stockpile:

	Tons	Iron	Phos.	Silica	Mang.	Alum.	Moist.	Iron Nat.
Atkins Extension Lease	51,558	46.73	-	12.82			← 7.85	

e. Complete Analysis of Season's Shipments:

	Iron	Phos.	Silica	Mang.	Alum.	Lime	Mag.	Sulph.	Loss
Atkins-Merritt,	46.92	.122	12.73	1.23	8.22	.35	.20	.010	9.36
Atkins Extension Lease,	47.20	.128	11.66	1.50	7.21	.35	.20	.010	10.64

4. ESTIMATE OF ORE RESERVES:

a. Developed Ore:
Factors:

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

	Reserve 12-31-47	Mined 1948	Balance After Mining	Changed By Re-Estimate	Reserve 12-31-48
Merritt:					
SE-NW 12-58-19,	71,839	30,204	41,635		41,635
Wade:					
NE-SW 12-58-19,	819,227	424,868	394,359	+ 90,862	485,221
NW-SE 12-58-19,	446,058	28,633	417,425	- 19,362	398,063
Total Wade,	1,265,285	453,501	811,784		883,284
Grand Total,	1,337,124	483,705	853,419	+ 71,500	924,919

ATKINS MINE
ANNUAL REPORT
YEAR 1948

4. ESTIMATE OF ORE RESERVES: (Continued)

c. Estimated Analyses:

	Tons	Iron	Phos.	Silica	Mang.	Alum.
Merritt:						
SE-NW¼ 12-58-19 No. 1 Ore,	25,507	56.63	.091	8.37	.81	2.47
SE-NW¼ 12-58-19 No. 2 Ore,	16,128	48.32	.128	11.01	1.76	6.33
Total Merritt,	41,635	53.41	.105	9.39	1.17	3.96
Wade:						
NE-SW 12-58-19 No. 1 Ore,	333,771	56.63	.091	8.37	.81	2.47
No. 2 Ore,	166,656	48.32	.128	11.01	1.76	6.33
NW-SE 12-58-19 No. 1 Ore,	190,281	56.63	.091	8.37	.81	2.47
No. 2 Ore,	192,576	48.32	.128	11.01	1.76	6.33
Total Wade, No. 1 Ore,	524,052	56.63	.091	8.37	.81	2.47
No. 2 Ore,	359,232	48.32	.128	11.01	1.76	6.33
Grand Total Wade,	883,284	53.25	.106	9.44	1.19	4.04
Grand Total No.1 Ore,	549,559	56.63	.091	8.37	.81	2.47
Grand Total No.2 Ore,	375,360	48.32	.128	11.01	1.76	6.33
Grand Total,	924,919	53.25	.106	9.44	1.19	4.04

The reserve shown as of December 31, 1948 represents the entire tonnage of shipping grade ore remaining in the Atkins Mine. It is anticipated that this will be mined out during the years 1949 and 1950.

5. LABOR & WAGES:

a. Comments:

There was an ample supply of labor in the Kinney district throughout the entire season and no labor troubles were encountered.

b. Comparative Statement of Wages & Product:

PRODUCTION:	
Direct Ore, ----------	483,705 tons
Number of Days Operated, ----------	144
Average Number of Men Working, --------	52
Average Wages Per Man, ----------	11.51
Production Per Man Per Day ----------	52.40
Labor Cost per Ton, ----------	.220
Total Number of Man-Days, ----------	9,231
Amount Paid for Labor, ----------	$106,332.25

ATKINS MINE
ANNUAL REPORT
YEAR 1948

6. GENERAL SURFACE:

a. Buildings, Repairs:

A small lean-to warehouse was added to the west side of the service garage during the year.

b. Roads, Transmission Lines, etc:

A new road was constructed around the pit extension to the southeast and telephone and transmission lines were shifted in the same area.

7. OPEN PIT:

a. Stripping:

The stripping program, which had been started following the 1947 ore season, was carried forward into the new year and conducted on a 20-shift per week basis until January 17th. Operations were then suspended and the equipment moved to the shops for repairs. The program was completed late in July through stripping in the lower benches in conjunction with the ore operation, when haulage conditions in the painty ore made mining impractical. A total of 76,766 cubic yards of surface and lean waste ore material was removed, completing the schedule of 526,805 cubic yards at a total average cost of $.345 per cubic yard. This compares with an estimated cost of $.358 for this work. In late July, a new program of stripping was started to extend the pit to the ultimate limits in the southeast. This involved stripping 340,000 cubic yards of surface material at an estimated cost of $.390 per cubic yard. With intermittent stripping in conjunction with the mining operation during the ore season and stripping on a 20-shift per week basis from November 1st to December 31st, a total of 178,964 cubic yards of stripping was removed at an average cost of $.277 per cubic yard. Taking advantage of the cheaper summer operating conditions and to the excellent stripping conditions in the late fall, very good progress was made as was reflected in the low unit cost.

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

E&A #AT.-4 Wade Extension,	76,766	cubic yards
E&A #AT.-7 Wade Extension,	178,964	" "
Total,	255,730	" "

b. Open Pit Mining:

Mining operations were started on April 29th, mining and stripping concurrently on a 3-shift, 5-day per week basis. Ore was mined whenever haulage conditions in the wet pit bottom would permit and the material was either shipped or stocked, so that shipments could continue from stockpile to meet boat schedules in wet and rainy weather.

ATKINS MINE
ANNUAL REPORT
YEAR 1948

7. OPEN PIT:
(continued)

b. Open Pit Mining:

A total of 483,705 tons was mined in 174 shifts. The average output per shift was 2,780 tons. The average cost of mining, that is, the cost of production, amounted to $.523 per ton. This consisted of $.279 per ton for Open Pit Mining, $.096 for General Pit Expense, $.031 for Stocking and Loading Ore, and $.117 for General Mine Expenses. The total cost of $.523 compares with a cost of $.450 realized in 1947. In view of the increase in wages and difficult mining conditions, with the increased haul for 1948, the costs realized were very satisfactory.

Of the total ore mined, 30,204 tons were taken from the Merritt property, which is owned in fee by Inland and Cliffs, and 453,501 tons were mined from the Wade Lease. Of the latter, 401,943 tons were shipped and 51,558 tons left in stockpile.

Operations were fairly slow throughout the year, due to the necessity of shifting back and forth from ore to stripping during rainy and wet periods. The production was further hampered by the necessity of stocking ore due to the lack of demand for the low grade product. As a result, it was necessary to stock ore and load from stockpile intermittently during the entire season. A small Bucyrus-Erie shovel was rented for the stockpile loading.

A bad rock slide, which occurred in September, took out about half of the haulage road leading to the pit screening plant on the north side of the pit and damaged the housing and motor generator set on the 54-B shovel which was working in the pit bottom. As a result, the screening plant and the conveyor system had to be abandoned. In order to make the mining operating conditions safe, it was necessary to mine the lean ore and waste ore material in the road bench on the north side of the pit, back to the solid slate wall. The shovel was out of commission until late November, when a motor generator set was rented while the Atkins set was being rebuilt. During the balance of the season it was necessary to rent a shovel for the mining operations and to haul all of the ore by truck to either the railroad loading ramp or a stockpile on surface.

In cleaning up the slide and stabilizing conditions in the north bank of the pit, it was necessary to mine 10,114 tons of lean ore and 20,905 tons of waste ore material, all of which had to be hauled to the surface piles.

c. Pumping and Drainage:

Aside from the generally wet condition in the pit bottom, there were no particular pumping and drainage problems during the year. However, a small sump and a drainage ditch were cut in ore at the west end of the pit in December, to take care of the spring run-off.

ATKINS MINE
ANNUAL REPORT
YEAR 1948

7. OPEN PIT:
(Continued)

c. Pumping and Drainage: (continued)
The ore was stocked in the aluminiferous stockpile. In order to take care of the drainage for the 1949 ore season, it will be necessary to carry a deep, secondary sump eastward as mining progresses, pumping the water into the main sump for re-handling.

10. COST OF OPERATION:

a. Comparative Mining Cost Statement:

	1948 COST PER TON	1947 COST PER TON
Pit Operating:		
Drilling and Blasting,	$ .003	$ .000
Power Shovels Operating,	.044	.039
Power Shovels Maintenance,	.011	.010
Trucks Operating,	.069	.065
Trucks Maintenance,	.069	.032
Pit Roads and Ramps,	.024	.023
Conveyors Operating,	.059	.032
Total Direct Ore	$ .279	$ .201
General Pit Expense:		
Pumping and Drainage,	.026	.034
Watchmen	-	-
General Open Pit Expense,	.014	.026
Open Pit Superintendent,	.017	.007
Stocking Lean Materials,	.001	.002
Pit Cleanup,	.003	.037
Exploratory Drilling,	.034	.008
Total General Pit Expense,	$ .096	$ .114
Total Pit Operating,	$ .375	$ .315
Stocking and Loading Ore,	.031	.030
Total Pit Expense,	$ .406	$ .345

ATKINS MINE
ANNUAL REPORT
YEAR 1948

10. COST OF OPERATION: (Continued)

a. Comparative Mining Cost Statement: (Continued)

	1948 COST PER TON	1947 COST PER TON
General Mine Expense:		
Mining Engineering,	$ .008	$ .007
Mechanical & Electrical Engineering,	.006	.005
Analysis and Grading,	.032	.030
Safety Department,	.003	.003
Special Expense,	-	.001
Ishpeming Office Expense,	.003	.002
District Office Expense,	.018	.009
Mine Office Expense,	.022	.013
Insurance- Property, etc.	.008	.004
Personal Injury Expense,	.001	.004
Social Security Taxes,	.010	.021
Geological,	.001	.001
Employees Vacation Pay,	.004	.006
Total General Mine Expense,	$ .117	$ .105
Idle and Winter Expense,	-	-
COST OF PRODUCTION,	$ .523	$ .450

b. Comparative Mining Cost:

The increased cost of open pit mining over the cost realized in 1947 was the result of an increase in labor rates and increased haulage and mining costs, due to increased depth and, further, to the necessity of hauling all of the ore by truck to surface after the slide in September. The increase of approximately $.078 was partially offset by a decrease in General Pit Expense of approximately $.020. General Mine Expenses were increased approximately $.012 and, as a result, the cost of production for the year of $.523 was $.073 above the cost realized in 1947. In view of the operating conditions, the costs secured were very favorable.

11. MAINTENANCE AND REPAIRS:

A general overhaul was given to all mining equipment during the early winter months in 1948 and repair work was conducted on the equipment as the need arose throughout the season.

ATKINS MINE
ANNUAL REPORT
YEAR 1948

12. EXPLORATIONS AND FUTURE EXPLORATIONS:

Nine drill holes were completed at the southeast end of the pit by the Leach Exploration Company during the year, with a total of 1,486 feet of drilling. This completely outlined the orebody on the property and resulted in a net increase of 187,695 tons in the ore reserve.

No further exploratory drilling is anticipated at this property.

13. TAXES:

The following is a statement of taxes at the Atkins Mine for the years 1948 and 1947:

	1948	1947	Increase	Decrease
Atkins Mine,	$13,532.76	$18,620.60		$5,087.84
Personal Property,	2,772.78	2,288.29	$ 484.49	
Total,	$16,305.54	$20,908.89		$4,603.35
Average Tax Rate,	95.54	105.51		9.97

The Atkins Mine was one of the 60 properties in St. Louis County which was revalued by the "Present Worth" or "Formula" method. Although there was an average increase of approximately 20% on all of the mines revalued, because of the quality of the ore and other conditions effecting the Atkins Mine, the application of the new method resulted in a decrease in valuation.

The decrease in taxes on mineral valuation in 1948, as compared to 1947, is due to a reduction in the classified valuation rate from an average of $0.1177 in 1947 to $0.0987 in 1948.

The increase in personal property tax is accounted for by the fact that new equipment was purchased prior to May 1, 1948.

The reduced tax rate of 95.54 mills in 1948, as compared to 105.51 mills in 1947, is accounted for by the fact that the County rate is down and also a generally increased mineral valuation in connection with per capita limitation for levying taxes, has the effect of lowering the mill rate.

ATKINS MINE
ANNUAL REPORT
YEAR 1948

14. ACCIDENTS AND PERSONAL INJURY:

There were no lost time, nor compensable accidents at the Atkins Mine during 1948, the Atkins having the best record in safety of any of the Mesaba Range mines operated by The Cleveland-Cliffs Iron Company.

15. EQUIPMENT AND PROPOSED NEW EQUIPMENT:

During the year, a 1-1/2-ton Ford pickup truck and a 500-gallon Ingersoll-Rand pump were received. It is expected that a 1-1/2-ton service truck will be purchased in early 1949 to replace the truck now on hand which is in rather bad condition.

CANISTEO MINE
ANNUAL REPORT
YEAR 1948

1. GENERAL:

Pit operations at the Canisteo were conducted throughout the year. Stripping was conducted on a 20-shift per week basis, during the early part of the year and again following the ore season. Mining operations were conducted on alternating weekly schedules of 3 shifts of 5 days per week and 2 shifts of 6 days per week. The third shift on alternating weeks and the free week-ends were used in removing lean and waste materials which were encountered in mining.

In addition to the usual maintenance, major repairs and general overhauling of the pit equipment were made whenever units could be spared from service. Unfortunately, lack of equipment prevented a complete overhaul of the pit units.

The stripping program in the South Bovey area, which was underway at the first of the year, was completed in March. In addition, a small yardage of stripping was taken from the East Bovey, and used in raising tailings pond dykes. April was devoted to pit clean-up. Due to lack of equipment, it was impossible to conduct stripping and mining operations concurrently with the machines which were available at the Canisteo Mine. A stripping program was, therefore, conducted by a contractor in the East Bovey and West Snyder during the mining season. At the close of the ore season, stripping operations were again resumed in the East Bovey and West Snyder.

Mining operations were started on April 27th, and conducted until October 23rd, on an alternating 2 shift and 3 shift basis, as outlined above. The ore was mined in the East Snyder and Hemmens bottom, the Mid-Snyder and in the South Bovey leases.

The washing plant was operated on the same schedule with the pit and satisfactory production was secured throughout the season.

Pumping was carried on continuously throughout the year, water being pumped either to the reservoir for use in washing ore, or over the South bank of the pit for waste. During the season, as the sumps were deepened, it was necessary to install an intermediate sump and high head pumps to handle the water which was pumped north into the washing plant reservoir.

An exploratory drilling program was conducted throughout the year, around the pit edges in the West Bovey, West Snyder and in the extreme end of the Hemmens pit. In addition, several sample holes were drilled in the pit bottom to assist in grading. Considerable additional ore was found in the West Bovey, which will necessitate a complete re-arrangement of surface tracks, stockpiles and other surface facilities.

CANISTEO MINE
ANNUAL REPORT
YEAR 1948

2. PRODUCTION, SHIPMENTS & INVENTORIES:

a. Production by Grades:

Snyder Crude,	580,535	tons
Bovey Crude,	1,066,858	"
Hemmens Crude,	127,556	"
Total Crude Ore,	1,774,949	"
Snyder Bessemer Concentrates,	46,613	"
Snyder Non-Bessemer Concentrates,	255,598	"
Bovey Bessemer Concentrates,	190,288	"
Bovey Non-Bessemer Concentrates,	351,219	"
Hemmens Bessemer Concentrates,	37,167	"
Hemmens Non-Bessemer Concentrates,	27,948	"
Total,	908,833	"

b. Shipments:

Snyder Bessemer Concentrates,	46,613	"
Snyder Non-Bessemer Concentrates,	303,578	"
Bovey Bessemer Concentrates,	190,288	"
Bovey Non-Bessemer Concentrates,	351,219	"
Hemmens Bessemer Concentrates,	37,167	"
Hemmens Non-Bessemer Concentrates,	27,948	"
Total,	956,813	"

c. Stockpile Inventories:

Snyder Stockpile Concentrates,	47,571	"

d. Production by Months:

(1) Crude Ore:

	SNYDER	BOVEY	HEMMENS	TOTAL
April,	1,328	28,633		29,961
May,	122,595	140,315	26,870	289,780
June,	163,471	127,049	7,204	297,724
July,	109,009	136,831	39,270	285,110
August,	92,665	181,947	36,979	311,591
September,	64,921	212,865	17,233	295,019
October,	26,546	239,218		265,764
Total,	580,535	1,066,858	127,556	1,774,949

CANISTEO MINE
ANNUAL REPORT
YEAR 1948

2. PRODUCTION, SHIPMENTS & INVENTORIES:

d. Production by Months:

(2) Concentrates:

	SNYDER	BOVEY	HEMMENS	TOTAL
April,	8,848	13,605		22,453
May,	51,161	58,649	10,991	120,801
June,	89,300	66,548	3,437	159,285
July,	60,976	72,563	21,902	155,441
August,	46,947	96,953	19,771	163,671
September,	31,958	110,074	9,014	151,046
October,	13,021	123,115	-	136,136
Total,	302,211	541,507	65,115	908,833

f. Ore Statement:

As of January 1,1948 there was a balance of 95,552 tons of Snyder concentrates in stockpile. This entire pile was shipped prior to the ore season and an overrun of 8,171 tons brought the actual weight of the stockpile up to 103,723 tons. During 1948 season 112,022 tons of Snyder concentrates were stocked during periods of car shortages. In November 64,451 tons were shipped, leaving 47,571 tons of Snyder concentrates in stock as of January 1, 1949.

3. ANALYSIS:

a. Tonnage and Analysis of Crude Ore:

	Tons	Iron	Phos.	Silica
Snyder,	580,535	41.93	.046	33.43
Bovey,	1,066,858	41.71	.042	34.46
Hemmens,	127,556	41.82	.032	34.19
Total,	1,774,949	41.79	.043	34.10

b. Tonnage & Analysis of Concentrates:

	Tons	Iron	Phos.	Silica	Mang.	Alu.	Moist.	Fe.Nat.
Snyder Bess. Concs.	46,613	55.89	.035	12.07	.63	.41	8.24	51.29
Snyder N.B. Concs.	255,598	55.49	.063	12.51	.64	.44	8.12	50.98
Bovey Bess. Concs.	190,288	56.62	.033	12.50	.49	.49	7.95	52.12
Bovey N.B. Concs.	351,219	55.15	.055	12.71	.94	.56	8.21	50.62
Hemmens Bess. Concs.	37,167	56.40	.028	11.88	.47	.39	8.12	51.82
Hemmens N.B. Concs.	27,948	56.46	.047	12.00	.53	.40	7.80	52.06
Total,	908,833	55.68	.050	12.52	.71	.49	8.12	51.16

c. Tonnage and Analysis of Shipments:

Snyder Bess. Concs.	46,613	55.89	.035	12.07	.63	.41	8.24	51.28
Snyder N.B. Concs.	303,578	55.76	.074	11.98	.61	.47	7.85	51.38

CANISTEO MINE
ANNUAL REPORT
YEAR 1948

3. ANALYSIS:
(Continued)

c. Tonnage and Analysis of Shipments: (Cont'd)

	Tons	Iron	Phos.	Silica	Mang.	Alum.	Moist.	Fe.Nat.
Bovey Bess. Concs.	190,288	56.62	.033	12.50	.49	.49	7.95	52.12
Bovey N.B. Concs.	351,219	55.15	.055	12.71	.94	.56	8.21	50.62
Hemmens Bess. Concs.	37,167	56.40	.028	11.88	.47	.39	8.11	51.83
Hemmens N.B. Concs.	27,948	56.46	.047	12.00	.53	.40	7.80	52.06
Total,	956,813	55.76	.054	12.35	.70	.50	8.03	51.28

d. Tonnage & Analysis of Ore in Stockpile:

Snyder Concs.	47,571	54.98	.043	13.45	.62	.42	8.42	50.35

e. Complete Analysis of Season's Shipments:

	Iron	Phos.	Silica	Mang.	Alum.	Lime	Mag.	Sulph.	Loss
Snyder Bess. Concs.	55.89	.035	12.07	.63	.41	.28	.19	.010	6.14
Snyder N.B. Concs.	55.76	.074	11.98	.61	.47	.27	.18	.011	6.32
Bovey Bess. Concs.	56.62	.033	12.50	.49	.49	.27	.19	.011	4.80
Bovey N.B. Concs.	55.15	.055	12.71	.94	.56	.26	.18	.011	5.95
Hemmens Bess. Concs.	56.40	.028	11.88	.47	.39	.27	.18	.010	5.89
Hemmens N.B. Concs.	56.46	.047	12.00	.53	.40	.28	.18	.011	5.53

4. ESTIMATE OF ORE RESERVES:

a. Developed Ore:

Factors Used: All Leases:	Cu. Ft. Per Ton Crude	% Rock Deduction	% Recovery
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 1948

4. ESTIMATE OF ORE RESERVES: (Continued)

a. Developed Ore: (Continued)

	RESERVE 1-1-48	MINED 1948	BALANCE AFTER MINING	RESERVE 12-31-48
Bovey:				
S½-NE 30-56-24	160,282		160,282	160,282
NW¼-SE 30-56-24	395,512	13,375	382,137	382,137
NE¼-SE 30-56-24	747,869	-	747,869	747,869
NE¼-NE 31-56-24	1,824,674	528,133	1,296,541	1,296,541
NW¼-NW 32-56-24	278,389		278,389	278,389
Total Bovey,	3,406,726	541,508	2,865,218	2,865,218
Hemmens:				
SW¼-SW 29-56-24	3,136,047	65,115	3,070,932	3,070,932
Snyder:				
SE¼-SW 30-56-24	1,259,696		1,259,696	1,259,696
SW¼-SE 30-56-24	341,443	32,609	308,834	308,834
SE¼-SE 30-56-24	739,748	269,601	470,147	470,147
Total Snyder,	2,340,887	302,210	2,038,677	2,038,677
Grand Total,	8,883,660	908,833	7,974,827	7,974,827

e. Estimated Analysis:

	Tons	Iron	Phos.	Silica	Mang.	Alu.
Bovey:						
Bess. Wash Concts.	760,202	57.56	.032	10.09	.31	.48
Non-Bess.Wash Concs.	1,261,502	57.07	.083	10.13	.66	.47
Bess. Retreat Concs.	175,460	56.30	.040	12.00	.30	.48
N.B. Retreat Concs.	668,054	55.50	.055	12.50	.36	.47
Total Bovey,	2,865,218	56.79	.060	10.79	.48	.48
Hemmens:						
Bess. Wash Concs.	1,197,233	57.70	.032	10.23	.30	.47
Non-Bess.Wash Concs.	982,026	57.08	.032	10.23	.30	.47
Bess.Retreat Concs.	338,800	56.30	.040	12.00	.30	.47
N.B. Retreat Concs.	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 1948

4. ESTIMATE OF ORE RESERVES: (Continued)

e. Estimated Analysis: (Cont'd)

	Tons	Iron	Phos.	Silica	Mang.	Alu.
Snyder:						
Bess. Wash Concs.	823,727	60.29	..037	8.97	.18	.29
Non-Bess. Wash Concs.	1,053,062	60.14	.064	8.26	.28	.36
Bess. Retreat Concs.	33,950	56.30	.040	12.00	.25	.41
N.B. Retreat Concs.	127,938	55.50	.055	12.50	.44	.49
Total Snyder,	2,038,677	59.84	.052	8.88	.25	.34
Totals:						
Bess. Wash Concs.	2,781,162	58.43	.033	9.82	.27	.42
Non-Bess. Wash Concs.	3,296,590	58.05	.062	9.56	.43	.43
Wash Concentrates,	6,077,752	58.22	.049	9.68	.36	.43
Bess. Retreat Concs.	548,210	56.30	.040	12.00	.30	.47
N.B. Retreat Concs.	1,348,865	55.50	.055	12.50	.39	.45
Retreat Concs.	1,897,075	55.73	.051	12.36	.36	.46
Total Bessemer,	3,329,372	58.08	.034	10.18	.27	.43
Total Non-Bess.	4,645,455	57.31	.060	10.41	.42	.44
Grand Total,	7,974,827	57.63	.049	10.31	.36	.44

5. LABOR AND WAGES:

a. Comments:

The supply of labor was adequate, with the exception of the month of September, when a great many college students returned to school. Comparatively few men were needed to build up to ore season strength because of the large winter stripping program and above average efficiency was obtained. A wage raise of 9½ cents for common labor and slightly higher rates for the higher pay grades was granted, effective July 16th. Good labor relations were maintained throughout the year.

CANISTEO MINE
ANNUAL REPORT
YEAR 1948

5. LABOR AND WAGES:
(Continued)

b. Comparative Statement of Wages & Product:

PRODUCTION:	
Direct Shipping,	None
Concentrates Shipped,	861,262 tons
Concentrates in Stock Dec. 31, 1948,	47,571 "
Concentrates in Stock Dec. 31, 1947,	95,552 "
Total Production,	908,833 "
Number of Days Operated, (1, 8-hour shift, 59, 2-8 hour shifts - 79, 3-8 hour shifts).	139
Average Daily Production,	6,538 tons
Average Wages Paid Per Day	12.096
Amount Paid for Labor,	$265,746.18

6. SURFACE:

a. Buildings and Repairs:

Ordinary maintenance work on mine buildings and houses was carried forward throughout the year. Two new Butler steel buildings were erected during the year. One, a 40' x 140' was erected at the shops for storage of motorized equipment, and the second, 40' x 60', was erected in the pit for truck service.

b. Roads, Transmission Lines, etc:

A 22,000-volt transmission line, to service the stripping conveyor system, was completed during the year.

c. Miscellaneous General Construction:

(1) - The stripping conveyor system was about completed during the year, with the exception of the portable hopper and screening plant, and a part of the electrical work. The system will consist of a 7-yard dragline with a 140-ft. boom, loading into a portable hopper and screening plant, onto the first section of a conveyor, 1,250 feet long. The second section, 2,020 feet long, with a 57-ft. lift, crosses through two culverts and over two railroads and highways to the dump located immediately north of the Village of Bovey. There it discharges onto a stacking conveyor for disposal.

The dragline, which had been promised for May delivery, did not arrive until September and the erection of the machine was not completed until late in November, which made it impossible to use the same in the conveyor stripping during the 1948 season.

(2) - A bad break in the tailings pond in September made it necessary to revise the whole tailings basin facilities, and extend the same to the northward. An adjoining forty was secured and dykes built during the late fall in preparation for the 1949 ore season.

CANISTEO MINE
ANNUAL REPORT
YEAR 1948

6. SURFACE:
(Continued)

c. Miscellaneous General Construction: (Cont'd)

The drilling in the North Snyder developed sufficient ore to necessitate a complete revision of the surface facilities in the vicinity of the washing plant. This will call for the re-location of the water reservoir; re-location of loading tracks and of stockpile grounds and re-location of all transmission lines, pipe lines, roads and other facilities servicing the area. This work was started immediately after the ore season and will be completed in the early spring, so that the facilities will be in operating condition at the opening of the ore season in early May.

7. OPEN PIT:

a. Stripping:

Stripping operations, which had been started in the fall of 1947, were completed in March and a total of 508,840 cubic yards of surface and lean waste ore material was removed in extending the pit limits in the South Bovey southward to the ultimate stripping limits. The operation, which was conducted in the winter months, was slow, due to narrow operating benches, heavy frost conditions and a high lift from the deep stripping in the pit to the top of the dump in the Canisteo Mine. The work was conducted on a 20 shift per week basis, rotating the men, so that they received 40 hours per week. This material was removed at an average unit cost of $.307 per cubic yard.

A new program, which was approved for the 1948-1949 season, called for the removal of 1,275,000 cubic yards of waste material. This would consist of 450,000 cubic yards of surface material to be moved from the South Bovey and the Hemmens by conveyor system; 300,000 cubic yards of surface from the West Snyder by shovel and truck and 300,000 cubic yards of surface and 225,000 cubic yards of waste ore materials from the East Bovey by mechanical stripping.

Due to the late delivery of the dragline for the conveyor system, it was necessary to revise the whole plan, and stripping in the East Bovey was started in late May, under contract with the Haley-Young Company and 86,189 cubic yards of surface were removed from this area at a cost of $.220 per cubic yard. The contractor completed the upper lifts early in June and the work was resumed on June 21st by the Canisteo Mine crews, using rented self-loaders and tractors. During the next month, 103,544 cubic yards from the two lower lifts of the surface were removed, at a cost of $.330 per cubic yard, which included the rental on all of the equipment, a long haul and a high lift.

A second contract by the Haley-Young Company was started in the West Snyder in August, removing 94,053 cubic yards of surface material from the upper benches at a cost of $.280 per cubic yard.

CANISTEO MINE
ANNUAL REPORT
YEAR 1948

7. OPEN PIT:
(Continued)

a. Stripping: (Continued)

This material was hauled to the dumps west of the Canisteo to prepare for a launching site for future stripping operations. At the close of the ore season, stripping was again resumed, with the Canisteo pit equipment in both the East Bovey and West Snyder. The work was conducted on a 20-shift per week basis, and a total of 403,509 cubic yards of waste material was removed, at an average cost of $.316 per cubic yard. The work in the East Bovey made good progress throughout the entire season. However, the stripping in the West Snyder was quite slow, due to an attempt to use the 7-yard dragline to lift the material from the lower benches to surface for reloading. It was thought, in this manner, that crews for future dragline operations could be broken in, and the operation in the West Bovey would avoid a long costly approach to the lower benches. The operation was satisfactory and the costs secured were quite good in consideration of the working conditions.

The following tabulation shows the stripping removed from the various leases for the year 1948:

Lease	Surface	Waste	Lean Ore	Paint Rock	Total
Bovey NE-NE 31	314,217	141,823	891	12,694	469,625
Bovey NE-SE 30	321,640	68,268	4,965	138,085	532,958
Snyder SE-SE 30		1,067		1,991	3,058
Snyder SE-SW 30	178,009	12,485			190,494
Total,	813,866	223,643	5,856	152,770	1,196,135

b. Open Pit Mining:

Ore production was started on April 27th and conducted until October 23rd. A large tonnage of crude ore and considerable waste and lean material, which was encountered in mining, made it necessary to operate on an alternating weekly schedule of three shifts, five days per week, and two shifts, six days per week, using a swing crew for the third shift at the washing plant, which worked week about, at the Holman and Canisteo Mine where a similar operation was in effect.

In a total of 356 shifts of mining, 1,825,877 tons of gross crude ore were produced. From the above, 50,928 tons of coarse rejects were removed in the pit screening plant, with 1,774,949 net tons of crude ore being sent to the mill. The average output per shift was 5,172 tons of gross crude and 5,020 tons of net crude. The pit mining cost per ton was approximately $.140.

Two shovels were kept in operation at all times to facilitate grading, this being necessary to mix the extremely lean ore from the south side of the pit with high grade material from the pit bottom.

CANISTEO MINE
ANNUAL REPORT
YEAR 1948

7. OPEN PIT:
(Continued)

b. Open Pit Mining: (Continued)

Ore was mined from three main areas covering five of the operating forties. At the east end of the pit, in the Snyder and Hemmens, ore was mined from the bottom, cleaning the same to rock. This area was cleaned up to permit its use as a main pit sump in the 1949 ore season. In the Mid-Snyder and West Bovey forties, clean-up operations were conducted in the pit bottom, left from former operations. In the South Bovey, where the bulk of the mining operations were conducted, ore was mined from layers both above and below the paintrock, with lean low grade wash ore being mined from the upper horizon, and higher grade material from the lower area. The ores from the various leases were mixed in an attempt to produce an average grade of concentrates throughout the season. The following tabulation shows the tonnage of concentrates produced from the various leases during the 1948 season:

East Snyder	- SE-SE 30	269,602 tons
Hemmens	SW-SW 29	65,115 "
Mid-Snyder	SW-SE 30	32,609 "
West Bovey	NW-SE 30	13,375 "
South Bovey	NE-NE 31	528,132 "
Total,		908,833 "

In addition to the crude ore mined, a total of 280,156 tons of pit rock and other waste and lean materials were removed during the ore season and disposed of in dumps in the pit bottom. This material was removed on the night shift on alternating weeks or on the free week-ends throughout the season, and represented a total of .308 tons of waste material per ton of concentrates produced.

c. Pumping and Drainage:

It was necessary to re-arrange the pit pumping facilities several times throughout the season as the mining was conducted in the pit bottom in the east end of the pit. As the operation deepened in the pit bottom, the head in pumping to the reservoir at the washing plant increased to such an extent that it was necessary to provide an intermediate sump and some auxiliary pumps in the north end of the pit, to provide water for washing operations. At other times, the waste water was pumped over the south bank to ditches leading south from the property. As the bottom was cleaned up in the East Hemmens, a new and deep sump was completed for the 1949 ore operations, and will be in use for the 1949 season.

CANISTEO MINE
ANNUAL REPORT
YEAR 1948

8. BENEFICIATION:

The concentrating plant was operated on the same schedules as the pit and a total of 908,833 tons of concentrates was produced from 1,774,949 tons net of crude ore. The average weight recovery was 51.20%, as compared with a recovery of 53.88% secured in 1947. The average output of concentrates per shift was 2,553 tons, which compares with 2,947 tons in 1947 and 2,339 tons in 1946. The low weight recovery and the necessity of handling considerable sticky ore, made it extremely difficult to operate at maximum capacity throughout the season. The necessity of operating three shifts per day on alternate weeks, likewise brought out the fact that there are many more operating delays on a three shift operation than one scheduled on two shifts, when the third shift could be utilized for necessary running repairs. However, in view of the operating conditions, the production throughout the season was very satisfactory.

The system of recirculating a part of the fine concentrates to increase the density in the classifier, was tried during the season and it was found that it was not practical, for the increase in quality was offset by a decrease in the tonnage of concentrates produced.

During periods of a shortage of cars, or a shortage of boats during the season, it was necessary to stock 112,022 tons of concentrates. This filled the entire stocking grounds to the absolute limits, and in the latter part of the season it was necessary to start an additional temporary concentrate pile east of the washing plant, adjacent to the tail tracks. A new stocking ground area is being prepared for the 1949 ore season and will provide ample room for all concentrates which it will be necessary to stock.

During the season, there were delays totaling approximately 103 hours. These consisted of approximately 19 hours in pit delays; 40 hours due to delays in plant machinery; 20½ hours due to electrical delays; 18 hours to pump and pipelines and 5½ hours in transportation and conveying.

The tonnage and analysis of the plant rejects were:

5' x 14' Screen Rejects

Lease	Tons	Iron	Phos.	Silica
Snyder,	23,283	27.02	-	58.82
Bovey,	25,233	26.92	-	58.60
Hemmens,	2,412	26.84	-	58.54
Total,	50,928	26.96	-	-

CANISTEO MINE
ANNUAL REPORT
YEAR 1948

8. BENEFICIATION:
(Continued)

36" Belt Rejects:

Lease	Tons	Iron	Silica
Snyder,	4,550	26.77	58.78
Bovey,	14,662	26.55	58.34
Hemmens,	459	25.77	60.04
Total,	19,671	26.58	-

The concentration data for the year was as follows:

	Tons	Percent of Total Mined	Percent of Iron Dried	Recoveries Tonnage	Recoveries Iron Unit
Material removed in mining,	1,937,674	100.00	41.00		
Less: Lean Ore stocked in mining,	78,807	4.07	37.51		
	1,858,867	95.93	41.15		
Less: Pit rock wasted	32,990	1.70	28.72		
Total transported to Mill,	1,825,877	94.23	41.38		
Less; Rock rejects in screen.plant,	50,928	2.63	26.96		
Crude Ore entering the mill,	1,774,949	91.60	41.79		
Concentrates produced,	908,832	46.90	55.68	51.20	68.22
Rock:Rejects on Mill Picking Belt,	19,671	1.02	26.58		
Tailings (by deduction)	846,446	43.68	27.23		
Total pit rock, screening plant rejects and lean ore,	162,725	8.40	32.43		

9. MAINTENANCE AND REPAIRS:

Maintenance repairs of motorized equipment were carried on continuously throughout the year, with no time available for a major overhauling. A good program of overhauling will be absolutely necessary previous to the 1949 ore season on all of these units.

CANISTEO MINE
ANNUAL REPORT
YEAR 1948

9. MAINTENANCE AND REPAIRS: (Continued)

The electric shovels were given what running repairs were absolutely necessary throughout the season and, late in the fall, the 3-1/4-yard shovel was moved to the shop site for a complete overhaul in preparation for the 1949 operations. Work on the 4-1/2-yard Bucyrus-Erie and 4-yard P & H shovels will be conducted previous to the 1949 operations. With stripping operations discontinued early in January, all of the pit equipment will be completely overhauled during the winter months for the first time since the start of the war. Peak operations during the past number of years have prevented anything but ordinary running repairs.

The usual washing plant repairs were carried on both before and after the ore season.

10. COST OF OPERATION:

a. Comparative Mining Costs:

	BUDGET ESTIMATE	COST PER TON 1948	COST PER TON 1947
PRODUCT:	900,000	908,833	854,638
Average Tons Per Shift,		2,553	2,947
Tons Per Man Per Day,		41.36	43.84
Number of Shifts Operated,		356	290
COST:			
Open Pit Mining,	$ .283	$ .284	$ .249
General Pit Expense,	.119	.121	.041
Concentrating,	.133	.145	.107
Stocking & Loading Concentrates,	.008	.009	.012
General Mine Expense,	.099	.115	.099
Idle and Winter Expense,	.212	.207	.160
Cost of Production,	$ .854	$ .881	$ .668
Amortization of Leasehold,	.150	.150	.203
Depreciation- Plant & Equipment,	.041	.041	.041
Depreciation- Motorized Equipment,	.034	.034	.070
Amortization- Stripping,	.369	.369	.370
Taxes - Ad Valorem,	.138	.138	.152
Taxes - Occupational,	.178	.178	.140
Taxes - Royalty,	.035	.035	.040
Total Cost at Mine,	$1.799	$1.826	$1.684
Miscellaneous Expense and Income,	.000	.000	.001
Grand Total,	$1.799	$1.826	$1.683

CANISTEO MINE
ANNUAL REPORT
YEAR 1948

10. COST OF OPERATION: (Continued)

The above figures are from the December cost sheet for comparison only.

b. Detailed Cost Comparison:

(1) Product:

The annual production figures for 1948 and 1947 afforded little similarity for comparative costs with the 1948 season, having the advantage of greater production. The greater production made it necessary to operate on a three-shift continuous basis for more than half the season, which was less efficient than a two-shift operation. The 1948 cost per ton of crude ore mined was almost the same as the 1947 cost, even though labor and materials were higher in 1948. Using lighter weight, leaner ores, it was difficult to get maximum tonnage, even though the conveyor belts were full. The lower recovery of 51.20% in 1948, against 53.88% in 1947, is reflected when comparison is made on a concentrate basis.

(2) Open Pit Mining:

In mining the crude ore, the 1948 costs were higher than 1947 costs and but $.001 higher than the estimated budget. The lower cost of drilling and blasting, $.012 per ton, was offset by an increased cost of shovels operating and maintenance of $.009 per ton. The transportation cost per ton was normal both years. In 1948, a cost of $.014 per ton was reflected against "Conveyors Operating". In previous years this was reflected under "Transporting and Conveying", under "Concentrating".

(3) General Pit Expense:

The budget here was set at $.119 per ton. The 1948 cost was $.121 or an increase of $.002 per ton. This is reflected against General Open Pit Expense, all other items under this caption being at par with the budget.

(4) Concentrating:

The 1948 cost was $.145 per ton as against a budgeted estimate of $.133 and a 1947 cost of $.107. The increased costs over the budget are reflected in the "Washing Ore" to the extent of $.006 per ton and $.007 per ton against "Maintenance- Buildings and Machinery".

(5) Stocking and Loading Concentrates:

The budget, set at $.008 per ton, was exceeded by $.001 per ton, due mainly to a larger proportion of concentrates stocked and reloaded.

(6) General Mine Expense:

The cost here per ton exceeded the budget by $.016. This is reflected mainly in an increased cost per ton of $.01 for District Office, an increase of $.002 in Mine Office, $.001 in Mechanical Engineering and $.003 in Social Security Taxes. Increased wages and cost of supplies, of course, accounts for all of these increases, rather than any increase in personnel.

CANISTEO MINE
ANNUAL REPORT
YEAR 1948

10. COST OF OPERATION: (Continued)

b. Detailed Cost Comparison: (continued)

(7) Idle and Winter Expense:

The budget estimate of $.212 per ton, when the final figures are available, will be very nearly correct. Charges through December at the mine, together with those available at the end of that month, reflect a cost of $.210 per ton. Adjustments made on the final cost sheet should approximate the budget figure.

(8) General:

Analysis of the costs show an increased labor cost of approximately 15% per ton over 1947 and an increased supply cost at the mine of about 12% per ton. Supplies and Expense (charges emanating from the Cleveland office) show an increased cost per ton of nearly 11%. A total overall increase of in excess of 8% is reflected in 1948 against 1947.

11. EXPLORATION AND FUTURE EXPLORATION:

A total of 3,381 feet of structural drilling was completed during the year, consisting of 3,221 feet of exploratory work and 160 feet of sample drilling.

The two sample holes in the South Bovey are to aid in grading for ore operations.

In the Hemmens dump site area, 980 feet were drilled to complete the program started in 1947, proving the barren character of the formation before covering with surface material. Two shallow holes and one deep hole to quartzite at 625 feet, completed the program.

A sizeable increase in the ore body, extending north in the southwest corner of the West Bovey, was outlined by 451 feet of drilling to complete the program started in 1947. This will necessitate moving the stockpile and tracks at the washing plant.

A total of 344 feet of drilling in the Bovey lease, north of the washing plant, checked the ore limits before a final layout for new stockpile and tracks could be completed.

In the Hemmens Lease, in the east end of the pit, 1,446 feet of drilling was done in general exploratory program. This program is being continued.

12. TAXES:

The following statement shows the Canisteo Mine taxes and the average annual rates for 1948 and 1947:

CANISTEO MINE
ANNUAL REPORT
YEAR 1948

12. TAXES:
(Continued)

	1948	1947	Increase	Decrease
Canisteo Mine,	$120,931.57	$121,158.41		$226.84
Washing Plant & Auxiliary Lands	1,072.32	962.85	$109.47	
Personal Property	7,927.70	7,517.15	410.55	
Total,	$129,931.59	$129,638.41	$293.18	
Village Lots,	208.74	221.92		13.18
Grand Total,	$130,140.33	$129,860.33	$280.00	
Average Tax Rate	117.87	125.29		7.42

There has been a general increase of 20% in the 1948 classified rates, applying to ad valorem taxes on open pit mines, in Itasca County, as compared to those used in 1947. This is the result of the State Tax Commissioner having adopted the "Present Worth" or "Formula" method of valuing open pit ore bodies. The increase in Itasca County was more or less arbitrarily applied, being based on an average increase of 20% found in using the "Formula" method, on sixty open pit mines in St. Louis County. Although there was a general protest against the method and manner of setting up the new valuations, it has been fixed on that basis for 1948.

There is a small decrease in the taxes on mineral valuation in 1948, even though the classified rates had been raised by 20%. This is largely accounted for by the reduction in ore reserves, due to shipments and also by the fact that the mill rate was lower in 1948 than in 1947.

The taxes on Washing Plant and Auxiliary Lands is slightly higher in 1948, due to the fact that the Assessor placed a higher valuation on certain parcels in this group.

Personal Property taxes are higher in 1948, due to the addition of the stripping conveyor.

The reduced tax rate of 117.87 mills for 1948, as compared to 125.29 mills for 1947, is accounted for by the fact that the County rate is down 6.07 mills and also, an increased mineral valuation in connection with per capita limitations for levying taxes, has the effect of lowering the mill rate.

CANISTEO MINE
ANNUAL REPORT
YEAR 1948

13. ACCIDENTS AND PERSONAL INJURY:

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

Name: John Riley February 24th.
Cause: Riley was assigned to take the 1½-ton Ford service truck to the pit water sump to haul the Littleford Heater back to the shop. Thawing operations were being carried on, preparatory to laying a 16" discharge line from the pit sump.

When Riley arrived at the location of the heating unit, he swung his truck to one side of the unit and about 10-15 feet from it and parked on a very slight grade, headed away and in a diagonal position from the heater. He placed a rock behind one set of duals. He then walked to the heating unit, where an employee was placing a side cover in position on the heater motor. Several other men were working in the pipeline ditch, but apparently no one noticed the truck slipping backwards on the icy ground. The truck tail gate caught Riley in the back, forcing him in a jack-knifed position and his right chest was crushed against the corner of the heating unit trap door (14" x 16") which was open. This door is used when starting the motor.

Riley's right chest was crushed with a compound fracture of a rib, which apparently lacerated his lung.
Time Lost: 91 days
Compensation Paid: $ 409.50.

Name: George Hecimovich April 7th.
Cause: Hecimovich and another employee were unloading two Euclid radiators from the service truck, when Hecimovich felt a sharp pain in his left side.
Time Lost: 12 Days
Compensation Paid: $ 27.00.

Name: Leslie Lee May 12th.
Cause: Lee signalled the truck driver not to back up and then he proceeded to bar the ore in the bin. However, the truck driver did not get the signal and he backed the truck up to the bumper, catching Lee's right leg between the left inside dual tire and the bumper. Lee straddled the bumper and was able to lean out far enough to wave to the driver, who released the pressure on Lee's leg by driving the truck forward.
Time Lost: 22 Days
Compensation Paid: $ 72.00

CANISTEO MINE
ANNUAL REPORT
YEAR 1948

13. ACCIDENTS AND PERSONAL INJURY: (Continued)

Name:	Donald Nelson	August 19th.
Cause:	Injured man jumped off from end of conveyor truss to ground about 5 feet below, wrenching left knee.	
Time Lost:	18 Days	
Compensation Paid:	$ 54.00	

Name:	Horace Storrs	October 1st.
Cause:	Storrs was cleaning out between rollers on stacker conveyor, which has a 24" belt. He put his left hand in between rollers to take out some ore and a belt splice caught on the cuff of his gauntlet glove, pulling his hand over lead roller and under the belt, injuring left arm and wrist.	
Time Lost:	39 Days	
Compensation Paid:	$ 175.50.	

14. PROPOSED NEW CONSTRUCTION:

It is proposed for 1949 to move the stockpile west of the plant, using a self-propelled stacker and trailing conveyor. There will be two piles with a trailer and stacker track running down the middle and stockpile loading track outside each pile. Ore will be conveyed from the present bins about 200 feet west to a new loading bin. When stockpiling concentrates, ore will be switched from the top of this bin through a chute and conveyor over to the trailing conveyor and stacker which can stock on either pile. The new stockpile will cover the present fresh water reservoir and it has been necessary to move this reservoir to the north and relocate the surface drainage ditch. The power lines, transformer station, telephone lines, House No. 6 and garage will also be moved.

15. EQUIPMENT RECEIVED AND PROPOSED NEW EQUIPMENT:

New equipment received in 1948 consisted of: one 7-W dragline; machinery for reclassification of fines, which consisted of two screens, two classifiers, and two pumps with motors; one "Caterpillar" #12 motor grader; one 2-1/2-ton International truck; one 8-yard Hendrix light-weight dragline bucket; one Pioneer belt stacker for concentrate stockpile; four 22-ton Euclid trucks; one 1,500-gal. Goulds pump; one 27-T blast hole drill; one D-8 "Caterpillar" tractor; and one Pettibone-Mulliken slurry pump for main tailings. Deliveries on equipment improved during the year, but repair parts are still scarce.

Proposed new equipment for 1949 is: One conveyor system and portable stacker for stockpiling concentrates; one radial drill press; two 22-ton Euclid dump trucks and one Allis-Chalmers HD-19 tractor.

HAWKINS MINE
ANNUAL REPORT
YEAR 1948

1. GENERAL:

The preparatory work for the installation of a conveyor system, which had been started immediately following the suspension of the 1947 ore operations, was carried forward with all possible dispatch, to insure it's completion for the 1948 season.

The work in the pit consisted mainly of mining and stocking all ore which would have been tied up under the lower sections of the conveyor, and all the excavating and grading necessary for the two conveyor flights, and the pit screening plant. The ore recovered was stocked in the pit bottom, adjacent to the screening plant, where it could be picked up later in the ore season. The heavy excavation was completed early in February and the shovels were moved to the shops for general repairs. The erection of the loading bins, conveyor flights and pit screening plant was completed and ready for use about the first of May.

Other pit activity consisted of re-arranging power lines, the construction of pit roads, and the scrapping and salvaging of pit tracks.

Winter repairs at the shops on haulage equipment and other mining equipment, were conducted during the early winter months on a five day per week basis. At the concentrating plant, in addition to the usual winter repairs on the ore washing equipment, the changes which were necessitated by the new haulage system, were carried forward on a five day per week basis, and the plant was ready for operation during the latter part of April.

During the month of April and the first part of May, the entire stockpile of concentrates, amounting to 39,016 tons, was loaded and shipped.

The 1948 ore season was started on May 10th, on a two 8-hour shift per day basis, working five or six days per week, as necessitated by shipments. A total of 1,247,246 tons of crude ore was produced in 237 shifts and the mining operations were completed on October 14th.

At the washing plant, a total of 660,037 tons of concentrates were produced from 1,205,139 net tons of crude ore. The concentrates consisted of 501,907 tons of regular concentrates and 158,130 tons of fine concentrates. During periods of car shortages, it was necessary to stock a total of 98,874 tons of concentrates, consisting of 87,301 tons of regular and 11,573 tons of fines. This material all remained in stock at the close of the year.

An extensive exploratory drilling program was conducted at the property throughout the entire year and 3,971 feet of drilling were

HAWKINS MINE
ANNUAL REPORT
YEAR 1948

1. GENERAL:
(continued)

completed. The drilling force consisted of one drill operated by the Leach Exploration Company, one by E. J. Longyear Company and one Company drill. The program was started in an effort to outline the entire ore body and to provide sufficient information for a re-estimate of the reserves at this property. The drilling available previous to this program, was sketchy and not sufficient to use for a comprehensive estimate.

2. PRODUCTION, SHIPMENTS & INVENTORIES:

a. Production by Grades:

Hawkins Crude,	1,205,139	tons
Hawkins Bessemer Concentrates #2,	-	
Hawkins Non-Bessemer Concentrates #2,	501,907	"
Hawkins Non-Bessemer Fines,	158,130	"
Total Production,	660,037	"

b. Shipments:

Hawkins Non-Bessemer #2 Concentrates,	453,622	"
Hawkins Non-Bessemer Fines,	146,557	"
Total Shipments,	600,179	"

c. Stockpile Inventories:

Hawkins Concentrates #2,	87,301	"
Hawkins Fines Concentrates,	11,573	"
Total,	98,874	"

d. Production by Months:

Crude Ore:

May,	106,858	"
June,	234,838	"
July,	269,363	"
August,	251,115	"
September,	239,348	"
October,	103,617	"
Total,	1,205,139	"

HAWKINS MINE
ANNUAL REPORT
YEAR 1948

2. PRODUCTION, SHIPMENTS & INVENTORIES: (Continued)

d. Production by Months:
(2) Concentrates:

	HAWKINS COARSE	HAWKINS FINES	TOTAL
May,	47,792	17,867	65,659
June,	89,885	43,667	133,552
July,	111,726	35,684	147,410
August,	110,236	24,727	134,963
September,	104,888	23,747	128,635
October,	37,380	12,438	49,818
Total,	501,907	158,130	660,037

f. Ore Statement:

As of January 1,1948, there was in stock at the Hawkins concentrator, a total of 39,016 tons of concentrates. This pile was loaded out completely, previous to the 1948 mining operations. During the season 87,301 tons of regular concentrates and 11,573 tons of fine concentrates were accumulated in stock and a total of 98,874 tons of concentrates were in stockpile at the end of the year, ready for 1949 shipments.

3. ANALYSIS:

a. Tonnage & Analysis of Crude Ore Produced:

	Tons	Iron	Phos.	Sil.	Mang.	Alu.	Moist.	Iron Nat.
Hawkins Concentrates,	1,205,139	41.56	.031	35.15				

b. Tonnage & Analysis of Concentrates Produced:

Hawkins #2 N.B.Concs.	501,907	56.71	.042	11.65	.61	.49	6.80	52.85
Hawkins N.B. Fines,	158,130	56.16	.034	14.16	.49	.52	7.65	51.86
Total,	660,037	56.58	.040	12.25	.58	.50	7.01	52.61

c. Tonnage & Analysis of Concentrate Shipments:

Hawkins #2 N.B.Concs.	453,622	56.73	.042	11.47	.61	.47	6.85	52.84
Hawkins N.B.Fines,	146,557	56.10	.034	14.19	.49	.52	7.68	51.79
Total,	600,179	56.58	.042	12.13	.48	.48	7.05	52.59

d. Tonnage & Analysis of Ore in Stockpile:

Hawkins #2 Wash Concs.	87,301	56.49	.040	12.34	.63	.52	6.63	52.75
Hawkins N.B. Fines,	11,573	56.87	.036	13.81	.53	.52	7.31	52.71
Total,	98,874	56.53	.040	12.51	.62	.52	6.71	52.74

HAWKINS MINE
ANNUAL REPORT
YEAR 1948

3. ANALYSIS:
(Continued)

e. Complete Analysis of Season's Shipments:

	Iron	Phos.	Silica	Mang.	Alum.	Lime	Mag.	Sul.	Loss
Hawkins #2 Wash Concs.	56.73	.042	11.47	.61	.47	.28	.20	.012	5.48
Hawkins N.B. Fines,	56.10	.034	14.19	.49	.52	.28	.19	.011	3.82

4. ESTIMATE OF ORE RESERVES:

a. Developed Ore:
Factors Used:

	Cu. Ft. Per Ton Crude	% Recovery
Wash Ore,	14	58.5
Lean Low Grade Wash Ore	14	35.0
Underground Wash Ore	14	58.5

	Reserve 12-31-47	1948 Mined	Balance after Mining	Reserve 12-31-48
SE-NE 31-57-22 O.P.Concs.	255,679	85,120	170,559	170,559
NE-SE 31-57-22 O.P.Concs.	1,125,234	542,817	582,417	582,417
NE-SE 31-57-22 U.G.Concs.	1,239,264		1,239,264	1,239,264
Total,	2,364,498	542,817	1,821,681	1,821,681
SW-NW 32-57-22 O.P.Concs.	304,667)	26,600	428,067	428,067
SW-NW 32-57-22 U.G.Concs.	150,000)			*
Total,	454,667	26,600	428,067	428,067
NW-SW 32-57-22 O.P.Concs.	5,530	5,500	30	30
NW-SW 32-57-22 U.G.Concs.	877,834		877,834	877,834
Total,	883,364	5,500	877,864	877,864
Grand Total,	3,958,208	660,037	3,298,171	3,298,171

* 150,000 tons U.G.Concs. transferred to "O.P.Concs."

Owing to the fact that there was not sufficient information for a re-estimate of the reserves at the Hawkins Mine, the reserve estimate as shown is based on the former estimates of the International Harvester Company, less the ore mined during the 1948 ore season.

HAWKINS MINE
ANNUAL REPORT
YEAR 1948

4. ESTIMATE OF ORE RESERVES: (Continued)

b. Prospective Ore:

A comprehensive drilling program is being conducted at the Hawkins Mine to drill out the present open pit areas and a possible extension along the townsite line on the northeast side. With the completion of this drilling program, a new reserve estimate will be made and it is thought that a large part of the ore, formerly carried as underground ore, will be changed to an open pit classification. The exploratory data available at the Hawkins Mine at the present time is not sufficient for a complete reserve estimate.

c. Analysis of Ore Reserves:

	Tons	Fe.	Phos.	Silica	Mang.	Al.
SE-NE 31-57-22:						
Bess. Wash Concentrates,	100,000	57.00	.035	11.20	.55	.49
Non-Bess. Wash Concts.	70,559	56.48	.042	12.30	.59	.48
NE-SE 31-57-22:						
Non-Bess. Wash Concts.	1,821,681	56.48	.042	12.30	.59	.48
SW-NW 32-57-22:						
Bess. Wash Concts.	225,000	57.00	.035	11.20	.55	.49
Non-Bess. Wash Concts.	203,067	56.48	.042	12.30	.59	.48
NW-SW 32-57-22:						
Non-Bess. Wash Concts.	877,867	56.48	.042	12.30	.59	.48
Total Bessemer,	325,000	57.00	.035	11.20	.55	.49
Total Non-Bessemer,	2,973,171	56.48	.042	12.30	.59	.48
Grand Total,	3,298,171	56.53	.041	12.19	.59	.48

5. LABOR & WAGES:

a. Comments:

The labor supply at the mine was sufficient throughout the greater part of the ore season. However, there was a slight shortage in September and October, when a number of students, who had been hired during the summer, returned to school. There was a general increase in the basic rates in July, when the average of common labor was increased from $1.09 to $1.185 per hour. Skilled trades and semi-skilled were increased in proportion.

HAWKINS MINE
ANNUAL REPORT
YEAR 1948

5. LABOR & WAGES:
(continued)

b. Comparative Statement of Wages & Product:

PRODUCT:

Concentrates Shipped,	561,163 tons
Concentrates in Stock,	98,874 "
Total,	660,037 "
Number of Days Operated,	121
Number of Shifts Operated,	237
Average Daily Product,	5,455
Average Product Per Shift,	2,785
Average Number of Men Working,	134
Average Wages Per Hour (Ore Season)	$1.485
Amount Paid for Labor, " "	$218,824.85

6. SURFACE:

a. Buildings, Repairs:

In addition to the ordinary maintenance work on the office, the dwellings and the mine buildings, a large steel truck storage building was completed at the shops and a 40' x 60' steel service shop was erected in the pit. At the concentrating plant, a small change house was erected and the equipment is being installed, so the building will be in operation for the 1949 season.

b. Roads, Transmission Lines and Tracks:

In addition to re-arranging transmission lines and building roads for the new truck operations in both mining and stripping in the pit, it was necessary to rebuild the decks of the two bridges across the highway and the Great Northern tracks leading to the washing plant, so that they could be adapted to truck haulage.

Tracks, which had become obsolete through the installation of a conveyor system, were removed and the steel and fittings were salvaged for disposal.

7. OPEN PIT:

a. Stripping:

Immediately following the ore season, preparations were made for a new stripping program, which involved the moving of 450,000 cubic yards of taconite, blocky paintrock and lean and waste ore material from the upper benches on the north side of the pit proper. Due to a change in dump space, which had been formerly approved by the fee owners, it was found that it would be necessary to truck all stripping off the formation, south of the main highway and Great Northern Railway tracks, to the former railway stripping dumps. This necessitated holding up of the actual start of stripping operations while roads could be constructed and while the two bridges over the State highway and the Great Northern tracks could be rebuilt and adapted

HAWKINS MINE
ANNUAL REPORT
YEAR 1948

7. OPEN PIT:
(Continued)

a. Stripping: (Continued)
to truck haulage. This preparatory work was not completed until late November. In the meantime, a curtailed stripping program was conducted, using the material for building necessary haulage roads and approaches.

Actual stripping operations got underway on November 24th, on a 20-shift per week basis, rotating the men so that they would receive 40 hours per week. Using one or two shovels and whatever trucks were available, a total of 139,840 cubic yards were removed up to the end of the year. Due to the extremely long haul, there were not sufficient trucks to service the loading equipment properly, and the operations were quite slow. The output per shift averaged only approximately 1,100 yards, and the cost per yard, up to January 1, 1949, was $.538, which was considerably higher than the original estimate of $.46 per cubic yard for taconite; $.35 per cubic yard for paintrock and $.30 per cubic yard for retreat material. The large increase in cost was due entirely to the extremely long haul and the slow-down in production, occasioned by the same. The original budget figures had been based on disposal of the material near the shops, with a haul of approximately 2,500 to 3,000 feet, rather than the two-mile haul to the south dumps.

b. Open Pit Mining:
Mining operations at the Hawkins were started on May 10th on a two, 8-hour shift per day basis, and carried forward until October 14th. The pit operated a total of 237 shifts and produced 1,247,246 tons of gross crude ore. From this, 42,107 tons of coarse rejects were scalped at the pit screening plant and stocked in the pit. The resultant net crude ore to the mill amounted to 1,205,139 tons. The average output per shift amounted to 5,263 tons of gross crude ore, 5,085 of net crude, after the elimination of the coarse rejects. The mining cost per ton of crude ore amounted to $.173.

Mining was conducted with 5 to 6, 20-ton Euclid trucks and two shovels at all times, for proper grading. The ore was produced from the stockpile in the pit bottom and from the upper benches and both the north and south sides of the pit. On the north side, in the taconite area, considerable wash ore was scrammed from the fissures in the rock formation. The latter involved the handling of a large amount of pit rock. In order to save considerable wear on the shovels, and a loss of time in moving for grading purposes, a 2-1/2-yard Diesel shovel was purchased and used for mining and scramming operations. This eliminated the necessity of moving in and out of rocky areas on the north side, and from the upper benches on the south side of the pit. Throughout the entire season, lean ores were mixed with high grade material in an effort to produce an

HAWKINS MINE
ANNUAL REPORT
YEAR 1948

7. OPEN PIT:
(Continued)

b. Open Pit Mining: (Continued)

average grade of concentrates. Mining conditions throughout the entire season were very good and the progress in January was satisfactory.

The new conveying system operated very satisfactorily and provided a continuous flow of crude ore during the greater part of the operating time. There were a few delays in the service from railroad transportation during the early part of the season, but the operations were generally synchronized throughout the entire year.

In addition to the crude ore mined, a total of 12,698 tons of pit rock was sorted out at the shovels, 21,630 tons of pit rock was loaded and used on pit roads and 4,036 tons of paintrock and other waste material were cleaned up at the shovels during the mining operations, making a total of 38,364 tons handled during the mining operations, in addition to the crude ore loaded. This represented a cost of $.018 per ton for each ton of concentrates produced.

c. Pumping and Drainage:

There were no pumping or drainage problems throughout the entire year and the former underground drainage system worked out very well.

8. BENEFICIATION:

Washing plant operations followed the same general schedule as the pit, and a total of 660,037 tons of ore was produced from 1,205,139 net tons of crude ore handled at the mill. The average output per shift amounted to 2,785 tons of concentrates and the average weight recovery was 54.77%.

In general, the concentrating plant operations were good and the increased capacity which was provided at the mill pocket and the elimination of the line shaft drives, worked out very well. An additional 20-ft. hydroseparator and hydrosizer were installed to increase the recovery of fine ore from the classifier tailings. There were no serious delays throughout the entire season and a fair production of concentrates was maintained at all times. At times of shortage of railroad cars and boats, it was necessary to stockpile a total of 98,874 tons of concentrates. This consisted of 87,301 tons of regular concentrates and 11,573 tons of fines. Of the regular concentrates, 46,690 tons were stocked with the stacking conveyor at the former fines stocking grounds, and it was necessary to truck 40,611 tons to a new stockpile, north of the plant. The 11,573 tons of fines were trucked to a fine ore concentrate pile, east of the plant.

HAWKINS MINE
ANNUAL REPORT
YEAR 1948

8. BENEFICIATION:
(Continued)

The amount and analysis of the plant rejects were as follows:

5 x 14 Screen Rejects

Tons	Iron	Phos.	Silica
42,107	23.76	-	-

(There were no 36" belt rejects during year 1948)

The rock removed from the pit and placed on the waste dump is as follows:

Tons - 10,962
Iron - 21.60

	Tonnage	% Total Mined	% Iron Dried	Tonnage Recovery	Iron Unit Recovery
Crude Ore and Rock Mined,	1,258,208	100.00	40.79		
Less: Rock Removed in Mining,	10,962	.87	21.60		
Crude Ore transported to Mill,	1,247,246	99.13	40.96		
Less: Rock Rejects in Screening Plant,	42,107	3.35	23.76		
Crude Ore Entering Mill,	1,205,139	95.78	41.56		
Concentrates Produced-coarse	501,907	39.89	56.71	54.77	74.56
fines	158,130	12.57	56.16		
Tailings (by deduction)	545,102	43.32	23.38		
Total as above,	1,205,139	95.78	41.56		

9. MAINTENANCE AND REPAIRS:

Previous to the ore season, the two power shovels, the two blast hole drills and the 20-yard dump cars were given a very good overhaul. In addition, the two new Diesel locomotives, which had been purchased second-hand, were inspected, checked over and given any necessary repairs. The usual winter repairs were conducted on all concentrating equipment and their drives.

HAWKINS MINE
ANNUAL REPORT
YEAR 1948

10. COST OF OPERATION:

a. Comparative Mining Costs:

	1948 BUDGET ESTIMATE	1948 COST PER TON
Crude Ore:		
Drilling and Blasting,	$ .032	$ .042
Power Shovels- Operating	.028	.032
Power Shovels- Maintenance	.008	.008
Stock Wash Ore in Pit	-	.019
Trucks - Operating	.040	.038
Trucks - Maintenance	.015	.008
Pit Roads and Ramps,	.015	.009
Conveyors Operating	.020	.017
Total Crude Ore,	$ .158	$ .173
Cost Per Ton Concentrates	.263	.317
General Pit Expense:		
Pumping and Drainage	.025	.024
General Open Pit Expense	.017	.024
Open Pit Superintendent	.007	.008
Stocking and Loading	.030	-
Exploratory Drilling	.030	.025
Total General Pit Expense	$ .109	$ .081
Total Pit Operating	$ .372	$ .398
Concentrating:		
Transportation or Conveying	.066	.089
Washing	.074	.063
Power - Pumping	.018	.017
Power - Mill Machinery	.016	.013
General Expense	.005	-
Maintenance- Building & Machinery	.028	.032
Total Concentrating	$ .207	$ .214
Stocking & Loading Concentrates	.010	.011
Total Pit & Concentrator	$ .589	$ .623
General Mine Expense:		
Mining Engineering	.013	.013
Mechanical & Electrical Engineering	.002	.002
Analysis and Grading	.030	.022

HAWKINS MINE
ANNUAL REPORT
YEAR 1948

10. COST OF OPERATION: (Continued)

a. Comparative Mining Costs: (Continued)

	1948 BUDGET ESTIMATE	1948 COST PER TON
General Mine Expense: (Continued)		
Safety Dept.	$ .002	$ .002
Special Expense	.002	.001
Ishpeming Office Expense	.002	.003
District Office Expense	.013	.019
Mine Office Expense	.029	.025
Insurance - Property, etc.	.005	.006
Personal Injury Expense	.002	.006
Social Security Taxes	.010	.009
Geological	.002	.001
Employees Vacation Pay	.018	.014
Total General Mine Expense	$ .130	$ .123
Idle and Winter Expense	.307	.284
Cost of Production	$1.026	$1.030

b. Detailed Cost Comparison:

Due to the fact that the system of mining in 1948 was entirely different from that in 1947, there was no sound basis for a comparison of the 1948 and 1947 costs. The comparison was made, therefore, with the budget estimate only.

There was a slight increase in the cost of mining and the cost of concentrating, mainly through an increase in the labor rates which had not been taken into consideration when the budget estimate was made, and through a smaller weight recovery than had been anticipated; otherwise, the costs actually realized during the year were quite close to those estimated.

11. EXPLORATIONS AND FUTURE EXPLORATIONS:

A rather comprehensive drilling program, which had been started late in 1947, was continued throughout the entire year to furnish sufficient data upon which the reserves of the Hawkins Mine could be re-estimated. The drilling information available was not sufficient for making a comprehensive estimate of the property and it did not furnish enough information for the proper classification of the ores

HAWKINS MINE
ANNUAL REPORT
YEAR 1948

11. EXPLORATIONS AND FUTURE EXPLORATIONS: (Continued)

which had to be concentrated. A program, involving the drilling of approximately 9,000 feet, was laid out and, during the year 1948, a total of 3,971 feet of drilling was completed. This work was done by the Leach Drilling Company, the E. J. Longyear Exploration Company and the Company drill.

Progress was fairly slow, due to the fact that a large percent of the drilling had to be conducted in the rocky areas and it was necessary, at times, to churn drill a part of the various holes through the heavy rock capping on the north side of the pit.

There was not sufficient data available at the end of the season for any definite statement as to the increase in tonnage, but indications from the results received to date would show that the tonnage in the pit bottom was increased both in wash and retreat ores and that there would be a fairly large increase in the tonnage of open pit wash ore concentrates. A substantial tonnage of retreat ore is likewise being developed and definite information on the same and the advisability of building a retreat plant will be established in 1949.

The program will be carried through to completion in 1949, when approximately 5,000 additional feet of exploration will be drilled by the Company drill and two contractor's outfits.

12. TAXES:

The following is a statement of the taxes for the Hawkins Mine for the years 1948 and 1947:

	1948	1947	Increase	Decrease
Hawkins Mine, (includes shops and locations),	$79,524.09	$65,094.62	$14,429.47	
Hawkins Mine Washing Plant,	5,719.84	3,834.57	1,885.27	
Hawkins Mine Aux. Lands,	1,127.86	1,084.12	43.74	
Hawkins Personal Property,	8,112.14	4,458.21	3,653.93	
Total,	$94,483.93	$74,471.52	$20,012.41	
Average Tax Rate,	191.65	208.25		16.60

HAWKINS MINE
ANNUAL REPORT
YEAR 1948

12. TAXES:
(Continued)

There was a general increase of 20% in the 1948 classified rates, applying to ad valorem taxes on open pit mines, in Itasca county, as compared to those used in 1947. This is the result of the State Tax Commissioner having adopted the "Present Worth" or "Formula" method of valuing open pit ore bodies. The increase in Itasca County was more or less arbitrarily applied, being based on an average increase of 20% found in using the "Formula" method, on sixty open pit mines in St. Louis County. Although there was a general protest against the method and manner of setting up the new valuations, it has been fixed on that basis for 1948.

The taxes for 1948 are not comparable to those for 1947, due to the fact that the figures for 1947 represent only 5/6ths of the total for that year. The 1/6th not shown was paid by the International Harvester Company.

The classified rates for mineral valuation were increased 20% as in the case of all other open pit mines in Itasca County.

The increase for personal property is partly due to the addition of five Euclid trucks, subsequent to May 1, 1947.

The reduced tax rate of 191.65 mills for 1948, as compared to 208.25 mills for 1947, is accounted for by the fact that the County rate is down 6.07 mills and, also, an increased mineral valuation in connection with per capita limitation for levying taxes, has the effect of lowering the mill rate.

13. ACCIDENTS AND PERSONAL INJURY:

There was a total of four compensable accidents and 47 slight accidents at the Hawkins Mine during the year. The four lost-time cases were as follows:

John Satovich, machine operator in the screening plant in the pit, injured June 9th, at 6:00 P.M. Injured right index finger while belt was in motion.

Steve Latkovich, exploration drill helper, injured July 12th, at 1:00 P.M. while pulling weight to one side. Injured toes of right foot when weight dropped.

Peter Drca, track laborer, injured November 19th, 2:00 P.M. Injured left foot when his partner dropped tie they were carrying

Matt Lehti, blast hole drill operator, injured December 20th, 12:30 A.M. Was pulling up bailer and injured left eye by coming in contact with handle of bell.

HAWKINS MINE
ANNUAL REPORT
YEAR 1948

14. PROPOSED NEW CONSTRUCTION:

At present, no new construction is planned for the Hawkins Mine. However, it will be necessary to design and build a retreat plant in the very near future.

15. EQUIPMENT AND PROPOSED NEW EQUIPMENT:

The following mine equipment was received at the property during the year:

1 - Bucyrus-Erie 2-1/2-yard 54-B Diesel power shovel
1 - Bucyrus-Erie 29-T Electric blast hole drill
1 - International TD-18 Tractor with blade
1 - International KB-1 Pickup truck
1 - International KB-1 Panel body pickup truck
1 - International KBS-5 Service truck
1 - Hystaway base unit and bucket with attachments
1 - Bucyrus-Erie #12 Bit dresser (for shops)

Proposed New Equipment for 1949

Proposed new equipment for 1949 will include: two 22-ton rear-dump trucks. Some consideration will likewise be given to the purchase of a 5-yard shovel to be used in the rock stripping. However, the latter will have to be deferred until the actual yardage of stripping has been set up by the present drilling program.

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1948

1. GENERAL

The normal winter stripping and repair program at the pit, mine shops and plants in effect at the close of the year 1947, was continued in 1948. The stripping schedule was continued on a 20 shift per week basis until February 19th, when the work was completed and the mine shut down.

The repair work was continued, on a 5-day per week basis, until March when, because of improved weather conditions, the work week was increased to six days and the work continued on this basis until the start of the ore season. At the mine shops, all drilling, loading and haulage equipment was overhauled and serviced. All necessary repairs were made to the pit screening plant and conveyor system. In addition, much shop work was done on plant machinery. During the idle period, all trucks, tractors and graders were given a general overhauling.

In the plants, general repair of all machinery was conducted. Several revisions were made in an effort to increase productive capacity and improve the grade of concentrates. The most important of these was the installation of a Humphrey spiral unit to treat the -1/8 fraction of the ore.

During April, the entire stockpile of 114,454 tons was loaded out.

The 1948 ore season began on May 3rd, on a 15-shift per week basis. Wash, retreat and direct ores were loaded on this schedule throughout the season, working a 6-day schedule only as conditions required. A total of 1,484,345 tons of crude (including direct ore) was produced, using, generally, one 4-1/2-yard shovel and six 20-ton trucks.

A scram crew, one shovel and two trucks worked throughout the season in the East Hill area, cleaning out small, isolated ore pockets. This ore, generally of low retreat grade, was stocked in the pit or mixed with ores from the other shovel.

Direct ore, produced only from the Hill-Delaware trespass area, totaled 145,131 tons for the 1948 season.

The washing plant, receiving 1,339,214 tons of crude ore, produced 262,203 tons of washed concentrates and 530,609 tons of retreat feed, for a shift average of 2,202 tons.

The retreat plant produced 361,060 tons of concentrates, giving an average production per shift of 1,543 tons. This low figure was due mainly to numerous operating difficulties encountered during the season.

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1948

1. GENERAL:
(Continued)

Because of car shortages and occasional grading problems, 133,874 tons of wash and retreat concentrates were stockpiled during the ore season. There was no stockpile loading at the close of the season.

The 1948 ore season closed on October 16th. Plants were cleaned out, repair work begun, and the pit operations immediately swung over to stripping. This project, on the north side of the Hill lease, was completed on November 26th, showing a total of 258,755 cubic yards of surface moved. The pit operations were then shut down for the remainder of the year, and general repairs to all pit and haulage equipment begun.

The exploration program in progress in the Trumbull pit at the beginning of the year, was discontinued in January. Several test pits in a rock dump area were dug in February and March. In December, following the completion of the stripping job, a test pit was sunk 40 feet deep in the newly-stripped area to obtain samples for test purposes.

2. PRODUCTION, SHIPMENTS & INVENTORIES:

a. Production by Grades:

Hill Crude,	22,266	tons
Trumbull Crude,	290,860	"
Hill Retreat Crude,	116,670	"
Trumbull Retreat Crude,	753,537	"
Total Hill-Trumbull Crude,	1,183,333	"
Delaware Crude (Oliver)	155,881	"
Grand Total Crude,	1,339,214	"
Hill Bessemer Concentrates,	3,478	"
Hill Non-Bessemer Concentrates,	12,019	"
Hill Bessemer Concentrates,	25,484	"
Hill Non-Bessemer Retreat Concentrates,	29,284	"
Trumbull Bessemer Concentrates,	25,502	"
Trumbull Non-Bessemer Concentrates,	134,180	"
Trumbull Bessemer Retreat Concentrates,	50,717	"
Trumbull Non-Bessemer Retreat Concentrates,	255,575	"
Hill Bessemer Direct,	16,157	"
Hill Non-Bessemer Direct,	55,905	"
Total Hill-Trumbull Production,	608,301	"
Delaware Concentrates,	87,024	"
Delaware Direct,	73,069	"
Total Delaware Production,	160,093	"
Grand Total Production,	768,394	

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1948

2. PRODUCTION, SHIPMENTS & INVENTORIES: (Continued)

b. Shipments:

Hill Bessemer Concentrates,	3,478	tons
Hill Non-Bessemer Concentrates,	12,168	"
Hill Bessemer Retreat Concentrates,	25,484	"
Hill-Non-Bessemer Retreat Concentrates	28,588	"
Trumbull Bessemer Concentrates,	25,501	"
Trumbull Non-Bessemer Concentrates,	105,067	"
Trumbull Bessemer Retreat Concentrates,	56,874	"
Trumbull Non-Bess. Retreat Concentrates,	259,543	"
Hill Bessemer Direct,	16,157	"
Hill Non-Bessemer Direct,	55,905	"
Total Hill-Trumbull Shipments,	588,765	"
Delaware Concentrates,	87,024	"
Delaware Direct,	73,069	"
Total Delaware Shipments to Oliver Iron Mining Company,	160,093	"

c. Stockpile Inventories:

As of January 1, 1948, there was in stock 9,008 tons of wash concentrates and 105,329 tons of retreat concentrates for a total of 114,337 tons. This pile was loaded out completely in April. On December 31, 1948, there was again in stock 37,973 tons of wash concentrates and 95,901 tons of retreat concentrates, for a total of 133,874 tons.

d. Production by Months: (Exclusive of Delaware line ore)

(1) Crude Ore:

MONTH:	HILL WASH	HILL RETREAT	TRUMBULL WASH	TRUMBULL RETREAT	TOTAL
May,			67,035	59,235	126,270
June,		34,118	50,458	144,746	229,322
July,	1,032	26,589	49,191	164,160	240,972
August,			49,819	175,790	225,609
September,	2,749	34,582	53,766	144,715	235,812
October,	18,485	21,381	20,591	64,891	125,348
Total,	22,266	116,670	290,860	753,537	1,183,333

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1948

2. PRODUCTION, SHIPMENTS & INVENTORIES: (Continued)

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

MONTH	HILL CONCTS.	HILL-RETREAT	TRUMBULL CONCS.	TRUMBULL RETREAT	TOTAL
April,	31	304		37	372
May,			36,225	20,616	56,841
June,		14,712	26,534	52,095	93,341
July,	627	12,901	24,621	68,938	107,087
August,			27,218	72,874	100,092
September,	1,993	16,262	31,331	64,632	114,218
October,	12,846	10,589	13,753	27,100	64,288
Total,	15,497	54,768	159,682	306,292	536,239 ✓

(3) Hill Direct: 72,062 ✓
608,301 ✓

f. Ore Statement:
As of December 31, 1948, there was a stockpile balance of 133,874 tons, consisting of 37,973 tons of Trumbull concentrates, 17,530 tons of Hill Retreat concentrates and 78,371 tons of Trumbull retreat concentrates. (repeat)

3. ANALYSIS:

a. Analysis of Crude Ore:

	Tons	Iron	Phos.	Silica
Hill Concentrates	22,266	45.78	.042	29.21
Hill Retreat Concs.	116,670	36.78	.029	43.76
Trumbull Concts.	290,860	38.80	.038	39.08
Trumbull Retreat Concts.	753,537	34.80	.033	44.80

b. Tonnage & Analyses of Production:

	Tons	Iron	Phos.	Sil.	Mang.	Alum.	Moist.	Fe. Nat.
Hill Bess.Concs.	3,478	58.94	.042	10.13	.18	.49	10.39	52.82
Hill N.B.Concs.	12,019	60.09	.055	8.02	.14	.43	8.68	54.87
Hill Bess. Retreat Concs.	25,484	57.26	.039	13.69	.10	.37	6.38	53.61
Hill N.B. Retreat Concs.	29,284	56.79	.041	14.23	.10	.37	6.05	53.35
Trumbull Bess. Concts.	25,502	57.71	.045	10.27	.13	.39	8.28	52.93
Trumbull N. B. Bess Concs.	134,180	56.90	.053	11.62	.12	.42	8.35	52.15
Trumbull Bess. Ret. Concs.	50,718	55.43	.044	13.44	.11	.39	7.32	51.37

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1948

3. ANALYSIS:
(Continued)

b. Tonnage & Analyses of Production: (cont'd)

	Tons	Iron	Phos.	Sil.	Mang.	Alum.	Moist.	Fe.Nat.
Trumbull N.B. Retreat Concs.	255,574	55.33	.049	13.72	.11	.37	7.24	51.32
Hill Bess.Direct	16,157	58.81	.045	10.59	.17	1.16	6.94	54.73
Hill Non-Bess. Direct,	55,905	58.65	.054	10.58	.20	.86	7.05	54.52
Total,	608,301	56.45	.049	12.61	.12	.45	7.46	52.24

c. Tonnage and Analysis of Shipments:

	Tons	Iron	Phos.	Sil.	Mang.	Alu.	Moist.	Fe.Nat.
Hill Bess.Concs.	3,478	58.94	.042	10.13	.18	.49	10.39	52.82
Hill N.B.Concs.	12,168	60.02	.055	8.13	.14	.43	8.64	54.83
Hill Bess. Retreat Concs.	25,484	57.26	.039	13.69	.10	.37	6.38	53.61
Hill Non-Bess. Ret. Concs.	28,588	55.71	.045	15.30	.11	.39	5.92	52.41
Trumbull Bess. Concts.	25,501	57.71	.045	10.27	.13	.39	8.28	52.93
Trumbull N.B. Concts.	105,067	57.29	.053	11.10	.12	.41	8.22	52.58
Trumbull Bess. Ret. Concs.	56,874	55.48	.044	13.37	.11	.39	6.59	51.82
Trumbull N.B. Ret. Concs.	259,543	55.60	.048	13.09	.12	.40	6.99	51.71
Hill Bess.Direct	16,157	58.81	.045	10.59	.17	1.16	6.94	54.73
Hill Non-Bess. Direct,	55,905	58.65	.054	10.58	.20	.86	7.05	54.52
Total,	588,765	56.55	.048	12.35	.13	.46	7.21	52.47

d. Mine Analysis of Ore in Stockpile:

Hill Retreat Concs.	17,530	56.87	.040	14.15	.10	.39	6.39	53.24
Trumbull Wash Concs.	37,973	55.07	.051	14.13	.13	.42	8.20	50.55
Trumbull Retreat Concs.	78,371	54.74	.047	14.71	.11	.36	7.00	50.91
Total,	133,874	55.11	.047	14.47	.11	.38	7.26	51.11

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1948

3. ANALYSIS:
(Continued)

e. Complete Analysis of Shipments:

	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss
Hill Bess.Concs.	58.94	.042	10.13	.18	.49	.26	.17	.010	4.31
Hill Non-Bess. Concts.	60.02	.055	8.13	.14	.43	.27	.16	.010	4.86
Hill Bess. Retreat Concs.	57.26	.039	13.69	.10	.37	.27	.16	.010	3.40
Hill Non-Bess. Retreat Concs.	55.71	.045	15.30	.11	.39	.27	.17	.011	3.94
Trumbull Bess. Concts.	57.71	.045	10.27	.13	.39	.26	.16	.011	6.11
Trumbull Non-Bess. Concs.	57.29	.053	11.10	.12	.41	.25	.15	.010	5.87
Trumbull Bess. Retreat Concs.	55.48	.044	13.37	.11	.39	.24	.16	.010	6.25
Trumbull N.B. Retreat Concs.	55.60	.048	13.09	.12	.40	.25	.15	.011	6.32
Hill Bess.Direct,	58.81	.045	10.59	.17	1.16	.28	.15	.011	3.45
Hill Non-Bess. Direct,	58.65	.054	10.58	.20	.86	.28	.16	.011	3.84

4. ESTIMATE OF ORE RESERVES:

a. Developed Ore:

Factors:	Cu.Ft. Per Ton Crude	% Rock Deduction	% Recovery
Merch. Ore	13	10	100.00
Wash Ore	14		59.58
Lean Wash Ore	14		47.40
Low Grade Wash Ore	14		59.51
Lean Low Grade Wash Ore	14		49.70
Retreat Ore	14		38.24

	RESERVE 12-31-47	MINED 1948	BAL. AFTER MINING	CHANGED BY RE-EST.	RESERVE 12-31-48
Trumbull Mine:					
NW-SW 17,56-23	470,270	2,542	467,728	-	467,728
NE-SW 17,56-23	872,892	463,432	409,460		409,460
Total Trumbull,	1,343,162	465,974	877,188		877,188
Hill Mine:					
SE-NW 17,56-23	63,227	24,826	38,401		38,401
SW-NE 17,56-23	348,087	47,002	301,085		301,085
SE-NE 17,56-23	297,670	70,499	227,171		227,171
Total Hill,	708,984	142,327	566,657		566,657
Grand Total,	2,052,146	608,301	1,443,845	-	1,443,845

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1948

4. ESTIMATE OF ORE RESERVES:

b. Prospective Ore:

The only prospective ore which might be developed at the Hill-Trumbull will be a possible pit extension in the Hill lease to the north-east toward the Hill-Barbara and some additional retreat ore on the north side of the Trumbull. This will depend, however, on the progress made in retreating ore during the next few years.

c. Estimated Analysis:

Lease Grade:	Tons	Iron	Phos.	Sil.	Mang.	Alu.
Hill:						
Non-Bessemer Direct,	91,881	56.36	.063	10.78	.17	.97
Bess. Wash Concentrates,	263,379	60.39	.030	10.62	.10	.47
Non-Bess.Wash Concs.	143,548	60.57	.043	11.24	.11	.44
Bess.Retreat Concs.	20,623	56.90	.039	12.85	.11	.48
Non-Bess.Retreat Concs.	47,226	56.52	.048	13.32	.12	.48
Total Hill,	566,657	59.33	.040	11.11	.12	.54
Trumbull:						
Bess. Wash Concs.	189,064	59.95	.041	6.21	.15	.50
Non-Bess.Wash Concs.	209,756	58.78	.055	8.06	.11	.46
Bess.Retreat Concs.	188,334	56.10	.040	12.15	.20	.50
Non-Bess.Retreat Concs.	290,034	56.00	.060	12.10	.20	.51
Total Trumbull,	877,188	57.53	.050	9.88	.17	.49
Total Direct,	91,881	56.36	.063	10.78	.17	.97
Total Bess.Wash Concs.	452,443	60.21	.035	8.75	.12	.48
Total Non-Bess.Wash Concs.	353,304	59.49	.050	9.35	.12	.45
Total Wash Concs.	805,747	59.89	.042	9.01	.12	.47
Total Bess.Ret.Concs.	208,957	56.18	.040	12.22	.19	.50
Total N.B. Ret. Concs.	337,260	56.06	.058	12.26	.19	.51
Total Retreat Concs.	546,217	56.11	.051	12.24	.19	.51
Total Bessemer,	661,400	58.93	.036	9.85	.14	.49
Total Non-Bessemer,	782,445	57.64	.055	10.77	.16	.54
Grand Total,	1,443,845	58.23	.046	10.35	.15	.52

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1948

5. LABOR & WAGES:

a. Comments:

The labor supply during the summer operating season continued short and, while not seriously affecting operating efficiency, this shortage resulted in payment of much overtime. The quality of labor available has improved somewhat. There were no labor disturbances at the property during the year and relations between the Company and the Union continued good.

b. Comparative Statement of Production & Wages:

PRODUCTION:	768,394 tons.
Number of Shifts and Hours,	3 - 8-hour.
Average Number of Men Working,	167
Average Wages Per Day,	$11.49
Product Per Man Per Day,	20.99
Labor Cost Per Ton,	.560
Total Number of Days,	135
Amount Paid for Labor,	$430,824.02

6. SURFACE:

a. Buildings and Repairs:

The steel building which housed the old pole pump on the shore of Penacie Lake, was moved to the washing plant for use as a warehouse. The pit truck service shop was moved a short distance in order to improve truck servicing facilities. A concrete floor, with a grease pit, was poured in this building. Other than this, only minor and necessary repairs were made to the mine building.

b. Roads, Transmission Lines, Tracks, etc:

Ordinary maintenance work required on all tracks, roads and power lines was carried on through the year. No changes of any consequence were made.

c. Miscellaneous General Construction:

There was no new construction at the Hill-Trumbull Mine during the year.

7. OPEN PIT:

a. Stripping:

The stripping program in effect at the close of 1947 was continued in 1948. This project, covered by E&A #MC-124, involved removal of surface and waste ore overburden in the southeast corner of the Trumbull lease. Two shovels were used whenever possible, serviced by 12 to 14 trucks, and this work was scheduled at 20-shifts per week, using four complete stripping crews, each crew working 40 hours per week. This project went on until February 19th, when the operations were shut down and the crews transferred to other mines in the district.

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1948

7. OPEN PIT:
(continued)

a. Stripping: (continued)

Material moved on this job during 1948 amounted to 244,356 cubic yards, of which 1,843 yards were surface, 2,270 yards lean ore and 240,243 yards waste ore. The lean ore was stockpiled in the pit for possible use as a low grade retreat ore. Surface and waste ore were wasted on dump lands provided for that purpose.

The average production per shift worked was 1,824 cubic yards. The cost per yard on this project since inception, averaged $.389. Both production and cost figures were adversely affected by the nature of this project, which required long, narrow cuts and resulted in confined working space in the pit. The unusually long haul, of well over 6,000 feet one way, also cut production with a consequent cost increase.

On October 18th, following immediately upon the close of the ore season, a new stripping project, E&A #MC-142, was begun on the north side of the Hill lease. Exploratory drilling has indicated a sizeable body of low grade retreat ore in this area, and it was decided to expose a small tonnage so that mill tests could be run on this material.

Two shovels, serviced by eight trucks, were used on this job, which operated on a 3-shift, 5-day per week schedule. Because of the short haul, excellent weather and generally good operating conditions, excellent progress was made on this work. A total of 258,755 cubic yards of surface were removed, giving an average production per shift of 3,044 cubic yards, and a cost per yard of $0.215. The project was completed on November 26th, and the crews were transferred to other mines in the district.

The following tabulation shows the stripping material moved during 1948:

Lease	Surface Cu.Yds.	Waste Ore Cu. Yds.	Lean Ore Cu. Yds.	Total Cu. Yds.
Trumbull,	1,843	240,243	2,270	244,356
Hill,	258,755	-	-	258,755
Total,	260,598	240,243	2,270	503,111

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1948

7. OPEN PIT:
(Continued)

b. Open Pit Mining:

The 1948 ore season was begun on May 3rd, on a 3-shift, 5-day per week basis. This schedule was maintained through the season, working six days per week when necessary, until October 16th when the ore mining operations ceased. The pit operated 399 shifts during the season, producing 1,528,007 tons of crude wash, retreat and direct ores, for a shift average production of 3,855 tons. Of this, 43,022 tons were removed in the pit as screening plant rock, leaving a net crude ore to the mill, or to cars, of 1,484,345 tons, for a shift average of 3,720 tons. Mining cost per ton of crude ore was $0.194.

Direct ore was mined entirely from the Hill-Delaware line area. Of the wash ore produced, part came from the line area and the remainder from the southeast corner of the Trumbull lease in the newly-stripped area. No ore was produced from the Hill lease, except along the Delaware line. The retreat crude was produced from both the Hill and Trumbull leases, the major production coming from the southeast Trumbull area. Hill retreat was mined from the north side of the pit and a small tonnage came from the scram area in the East Hill. Retreat ore mined during 1948 was of poorer grade than that previously encountered, and resulted in a more costly operation and lower grade concentrate. Direct and wash ores were of average grade and presented no unusual problems.

A scram crew worked one shift per day in the Hill scram area. Most of this material was a rocky, lean, retreat ore that required continual sorting at the shovel, with resultant low production. From this operation, 7,720 tons of rock were removed and stocked in the pit. Cost of this operation was mostly absorbed in the crude ore mining costs, but was, in general, high. However, it is felt that considerable ore can be recovered in the scram areas and it is intended that this work be continued. Improvements in plant metallurgy will greatly aid this part of the operation, as the mining need not then be so selective.

c. Pumping and Drainage:

Pit pumping at the Hill-Trumbull was handled by the deep well pump as in the past. However, this pump will no longer drain the bottom of the Trumbull. Mining plans during 1948 were directed toward preparing the Trumbull pit for sump pumping. A pump has been obtained and early in the 1949 season will be installed and the well abandoned. Pit pumping cost per ton was $0.015.

d. General Pit Activities:

Pit activities in the main were confined to mining ore. Except for the scram rock, there was no lean ore or rock moved during the ore season, and no stripping was done during this period. A major problem, that of dump area for pit and screen rock, was temporarily

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1948

7. OPEN PIT:
(Continued)

d. General Pit Activities: (continued)
solved by cleaning to rock an area adjacent to the previous rock dump. A small charge of $0.005 per ton was made to cover clean-up work done during April, just before the ore season.

8. BENEFICIATION:

a. Washing Plant:

Washing plant operations followed the same general schedule as the pit, starting on May 3rd, and shutting down October 16th. Crude ore feed to this plant totaled 1,339,214 tons, of which 469,007 tons were wash ore crude and 870,207 tons retreat. The plant produced 262,203 tons of washed concentrates and an estimated 530,609 tons of retreat plant feed, giving a total washing plant concentrate production of 792,812 tons. Operating 360 shifts, the average concentrate production per shift was 2,202 tons. Weight recovery on wash ore averaged 55.9%.

In general, operation of the washing plant was satisfactory. Some trouble was encountered early in the season, but was soon corrected. The grade of the wash concentrate was satisfactory, except during the first month, when retreat plant delays required turning out, as washed concentrates, material that really should have been retreated.

Because of car shortages and occasional grading problems, 37,973 tons of washed concentrates were placed in stockpile. No stockpile ore was loaded out at the end of the ore season.

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

Source of Delay	Hours Lost	% of Total Wk.Hours
No crude ore	53.8	1.87
Electrical, no power	3.7	.14
Screens	40.4	1.39
Pump and Pipe Lines	19.0	.66
Conveyors	6.7	.24
Track delays	34.6	1.22
Total,	158.2	5.52

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1948

8. BENEFICIATION:
(Continued)

The analysis of the plant rejects for the season 1948 is as follows:

Screen Plant Rejects

Lease	Tons	Iron
Hill,	380	19.29
Trumbull,	3,360	19.56
Total,	3,740	19.53

The complete concentration data for the year 1948 was as follows:

	Tonnage	% Total Mined	% Iron Dried	Tonnage Recovery	Iron Unit Recovery
Crude ore & rock mined,	324,646	100.00	38.61		
Less: Rock removed in mining,	7,780	2.43	20.13		
Crude ore transported to mill,	316,866	97.57	39.07		
Less; Rock removed in screening plant,	3,740	1.15	19.53		
Crude ore entering mill,	313,126	96.42	39.30		
Concentrates produced,	175,179	53.94	57.26	55.95	81.51
Rock rejects on mill picking belt,	-	-	-		
Tailings (by deduction)	137,947	42.48	16.49		
Total as above,	313,126	96.42	39.30		

b. Retreat Plant:

The retreat plant was started on May 17th and continued until October 16th, on the same schedule as the washing plant and pit. From a retreat feed of 530,609 tons, there was produced 361,060 tons of concentrates. Operating 234 shifts during the season, this plant produced an average of 1,543 tons per shift. Net weight recovery averaged 41.5%. Stockpiled retreat concentrates totaled 95,901 tons.

Following considerable experimentation during 1947 with Humphrey spirals, it was decided to use these machines to concentrate the -1/8" fraction of the retreat ore. Eighty-four spirals were installed, taking as feed the classifier product after grinding in the ball mill. These machines showed considerable improvement over the Selective Media Classifiers previously used, and, with improvements planned for 1949, should continue to handle this troublesome material satisfactorily.

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1948

8. BENEFICIATION:
(Continued)

b. Retreat Plant: (continued)

In an effort to further improve the operation of the heavy density plant, a major revision of this unit was begun at the end of the season. Plant machinery is being re-arranged, magnetic separator capacity increased, and capacity of the fine retreat unit increased through installation of a Humphrey counter-current classifier to be used as a heavy media separator. This capacity increase will be necessary as the plant feed will be crushed finer, throwing a greater load on this unit. Addition of 16 spirals will increase the capacity of that unit. Use of a surge pile will smooth out the ore flow to the mill and will provide surge capacity to take care of mill interruptions in either the wash or retreat plants.

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

Source of Delay	Hours Lost	% of Total Wk. Hours
Conveyors	28.6	1.53
Screens	35.0	1.94
Separators	8.5	.45
Pumps and Pipe Lines	38.2	2.04
Media circuit	18.3	.98
Surge pile	8.3	.44
Out of cars	12.7	.68
Loading track	26.8	1.43
Miscellaneous	11.3	.60
Total,	197.7	10.09

The concentrating data for year 1948 is as follows:

	Tonnage	% Total Mined	% Iron Dried	Tonnage Recovery	Iron Unit Recovery
Crude ore & rock mined	908,189	100.00	34.38		
Less: Rock removed in mining,	100	.01	19.70		
Crude ore transported to mill,	908,089	99.99	34.37		
Less: Rock rejects in screening plant,	37,882	4.17	18.52		
Crude ore entering mill	870,207	95.82	35.07		
Retreat plant feed produced	529,208	58.27	47.44	60.81	82.26
Tailings (by deduction)	340,999	37.55	15.86		
Retreat Concts.Produced	361,060	39.75	55.59	41.49	65.76
Retreatrejects	84,635	9.32	28.07		
Tailings (by deduction)	83,513	9.20	31.83		

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1948

9. MAINTENANCE AND REPAIRS:

During the period following the termination of stripping, in the spring, and again in November, an intensive program of repair to all pit equipment was carried on. All trucks, tractors, drills, shovels and pumps were brought into the shop for a general overhaul. The haulage locomotives and dump cars were also repaired. The pit screening plant and conveyor system were gone over thoroughly. Plant repairs were, as usual, extensive, and several changes were made in the flowsheet as already covered under the heading of Beneficiation. In general, the pit and haulage equipment was in excellent condition and very few breakdowns were encountered during the operating season. Plant machinery ran satisfactorily, except in a few cases, and troubles here were mainly due to operating problems rather than breakdowns.

10. COST OF OPERATION:

a. Comparative Mining Costs:

	1948 BUDGET	1948 COST PER TON	1947 COST PER TON
PRODUCT:			
Direct Shipping Ore	143,000	145,131	13,129
Wash Concentrates	195,000	262,203	152,930
Retreat Concentrates	421,000	361,060	619,545
Total production,	759,000	768,394	785,604
(Recovery)	44%	46.5%	44%
Average Daily Output		5,692	5,101
Tons Per Man Per Day		20.99	
Days Operated		135	154
COST:			
Open Pit Direct Ore	$.147	$ .120	$ .135
Open Pit Crude Ore	.338	.330	.311
General Pit Expense	.100	.038	.091
Concentrating	.371	.548	.509
Stocking Concentrates	.009	.001	.000
General Mine Expense	.143	.126	.154
Idle and Winter Expense	.260	.401	.255
Cost of Production,	$1.116	$1.302	$1.302

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1948

10. COST OF OPERATION: (Continued)

a. Comparative Mining Costs: (Continued)

	1948 BUDGET	1948 COST PER TON	1947 COST PER TON
COST: (Continued)			
Depreciation- Plant & Equipment -		$ .086	$ .059
Depreciation- Motorized Equipment,		.072	.031
Amortization- Stripping,		.274	.301
Taxes - Ad Valorem,		.071	.073
Taxes - Occupational,		.029	.018
Taxes - Royalty,		.070	.068
Total Cost at Mine,		$1.904	$1.854
Administrative Expense,		.095	.089
Miscellaneous Expense and Income,		.015	.011
Grand Total,		$1.984	$1.932

The cost per ton figures for 1947 and 1948 are both taken from the mine cost sheets before final revision by the Cleveland office and are, therefore, comparable.

b. Detailed Cost Comparison:

The cost of producing direct ore showed a slight decrease from the 1947 cost and budget estimate, due largely to improved operating conditions in the line area, allowing greater production per shift.

Crude ore mining costs compared favorably, being only $.018 over the 1947 costs. Overage was mainly due to increased truck operating and maintenance costs. Other costs in this category showed slight variations. Drilling was up $.003, due to rockier ore. Loading was down $.004 due to use of only one shovel as mixing was generally unnecessary in 1948.

General pit expense was well under the budget and 1947 costs. Pumping costs were low because no pit pumping was done. Scramming costs were well below the budget because most of this expense was absorbed in crude ore mining. Largest drop was in pit clean-up; very little work of this nature was done. Also, no exploratory drilling was done during the season.

Concentrating costs showed a rise of $.177 over the budget and $.037 over 1947. This was due to increased cost of retreat plant operation, increased transportation, pumping, washing and maintenance of buildings and machinery. Expected improvements

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1948

10. COST OF OPERATION: (Continued)

b. Detailed Cost Comparison: (Continued)

in production rate were not attained, due largely to difficulties experienced with the operation of the Humphrey spirals and pumping of heavy tailings.

Maintenance of buildings and machinery was slightly over the 1947 cost and $.064 over the budget. This was due to the changes necessary in the mill during the operating season while experimenting with and refining the flowsheet.

General mine expense was below both the budget and the 1947 costs. Largest reduction was in analysis and grading. Other items showed little change.

Idle and winter expense showed an increase of $.146 over 1947 and $.091 over the budget. It was due mainly to the major repairs and revisions in the wash and retreat plants, all of which cost more than anticipated.

11. EXPLORATION AND FUTURE EXPLORATION:

The exploratory drilling program in the Trumbull pit continued from 1947, was completed in January, 1948, and no further structure drilling was done. If the material uncovered by the recent stripping project proves usable, a large drilling program will be necessary on the north side of the Hill lease. There is a strong possibility that retreat ore occurs along the West Trumbull-Gross-Marble line and exploration is planned in this area.

Several shallow test pits were sunk in the Hill to check a rock dump area. Following the stripping season, one test pit was sunk to 40 feet in the newly stripped area to obtain samples for laboratory tests.

12. TAXES:

The following table shows a comparative statement of taxes and average rate at the Hill-Trumbull Mine for the years 1948 and 1947:

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1948

12. TAXES:
(Continued)

	1948	1947	Increase	Decrease
Hill Mine,	$17,958.23	$18,619.68		$ 661.45
Trumbull Mine,	20,701.66	22,775.42		2,073,76
Hill-Trumbull Shops	1,151.51	1,236.93		85.42
Hill-Trumbull W.P.Lands	8,562.71	8,908.44		345.73
Personal Property	6,106.47	6,005.21	$ 101.26	
Total,	$54,480.58	$57,545.68		$3,065.10
Village Lots	476.17	461.21	14.96	
Grand Total,	$54,956.75	$58,006.89	-	$3,050.14
Average Tax Rate,	124.87	133.75		8.88

There has been a general increase of 20% in the 1948 classified rates, applying to ad valorem taxes on open pit mines, in Itasca County, as compared to those used in 1947. This is the result of the State Tax Commissioner having adopted the "Present Worth" or "Formula" method of valuing open pit ore bodies. The increase in Itasca County was more or less arbitrarily applied, being based on an average increase of 20% found in using the "Formula" method, on sixty open pit mines in St.Louis County. Although there was a general protect against the method and manner of setting up the new valuations, it has been fixed on that basis for 1948.

Although there was a 20% increase in the classified rates for the mineral valuation in the Hill and Trumbull Mines, the reduction in reserve tonnage, due to shipments, resulted in a decrease in taxes. Also, the mill rate is lower for 1948 than for 1947.

The decrease in the taxes on the Hill-Trumbull shops and washing plant lands is due to a reduction in the tax rate.

The increase in personal property tax is due to the fact that additional equipment was purchased in 1948.

The slight increase shown for Village Lots is the result of the Assessor placing a higher valuation on this property.

The reduced tax rate of 124.87 mills for 1948 as compared to 133.75 mills for 1947 is accounted for by the fact that the County rate is down 6.07 mills and, also, an increased mineral valuation in connection with per capita limitations for levying taxes, has the effect of lowering the mill rate.

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1948

13. ACCIDENTS AND PERSONAL INJURY:

Name: Frank Nelson. Date: December 2,1947.
Cause: Was walking up the stockpile and slipped, spraining his right knee.
Nature: Strained quadriceps tendon and posterior ligaments right knee.
Time Lost: 6 weeks, 1 day
Compensation: $166.50.

Name: Frank Hill Date: September 18th.
Cause: Spilled gasoline on clothes while filling a barrel. Lit a cigarette directly after and his clothes ignited, burning his face and hands.
Nature: 1st, 2nd and 3rd degree burns on face, arms and hands.
Time Lost: 14 weeks
Compensation: $378.00

Name: Donald Ostander Date: September 16th.
Cause: Took wrong road to shovel, went over bank with Truck #59.
Nature: Clothes soaked with battery acid. Marked pains and tenderness dorsal vertebrae. Possible fracture of vertebrae and ribs.
Time Lost: 3 Weeks, 2 days
Compensation: $63.00.

Name: Ray Schmitt Date: September 4th.
Cause: Was tightening bolts and wrench slipped, striking him on left side.
Nature: No definite evidence of injury. Possible injury to ribs on left side of thorax.
Time Lost: 3 Weeks
Compensation: $54.00.

Name: Edward Whiteford Date: October 14th.
Cause: Tripped by a piece of haywire and fell on his arm, which had previously been fractured.
Nature: X-ray shows a possible re-fracture of left arm.
Compensation: $108.00.

HILL-TRUMBULL MINE
ANNUAL REPORT
YEAR 1948

14. PROPOSED NEW CONSTRUCTION:

At present, there is no proposed new construction at the Hill-Trumbull Mine.

15. EQUIPMENT RECEIVED AND PROPOSED NEW EQUIPMENT:

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

1 - Portable Light Plant
12" Slurry Pump
4" x 6" Laboratory Crusher
8" x 6" Allis-Chalmers Pump
5" x 4" Allis-Chalmers Pump
3" Sand Pump
24" Weightometer
35-ft. Thickener
10 x 8 Allis-Chalmers Pump
84 - Humphrey Spirals
60" Akins Classifier
5' x 8' Rod-Deck Screen
8" x 6" Allis-Chalmers Pump
27-T Blast Hole Drill
2 - International Pick-up Trucks
325 H.P. General Electric Motor for Tailings Pump
150 H. P. Motor
5 - GT-2-Stage Double Suction, Ball-Bearing, Horizontal Volute Centrifugal Pumps
1 - Novo Pump
1 - Ford Pick-up truck

Proposed new equipment:

1 - HB-19 Allis-Chalmers Tractor
2 - 22-ton Euclid trucks
16 - Humphrey Spirals
3 - Hardinge Counter-Current Classifiers
1 - 48" Dings Magnetic Separator
2 - Allis-Chalmers Lo-Head Screens

(Also miscellaneous pumps, conveyors and feeder for wash and retreat plants).

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1948

1. GENERAL:

At the Holman-Cliffs Mine, pit operations, involving either ore production or stripping, were continuous throughout the year of 1948, except for the legal holidays and short layoff periods, due to adverse weather conditions.

The 1948 ore shipments were started on April 17th, with the loading of Brown #2 concentrates from the stockpile, which was loaded to completion by the 27th. Again, in the fall, from the new stockpile accumulated during the ore season, partial loading was conducted from October 20th to November 16th.

Mining ore from plant production got underway on the 30th of April, alternating weekly on working schedules of five days, at three shifts per day and six days at two shifts per day. The free week-ends and third shifts were utilized in lean material movement from the ore areas. The bulk of ore material was from the pit bottom of the Brown #2 and Holman leases, and pit production was brought to a close on October 16th.

Washing plant production was conducted on the same schedules established for the pit. The mill operated throughout the season, with very few mechanical delays, although the wet ore from the pit stinted the rate of feed at times. Due to a shortage of railroad cars, it was necessary to stockpile concentrates at times.

The new fine ore plant erection was completed and production was started on June 12th, on a single shift basis and, as operators were broken in, stepped up to a 3-shift per day schedule by the 21st. Considering the newness of the operation, comparatively few obstacles were encountered and good products were recovered. With the advent of cold weather, the plant was closed on October 12th.

The stripping program (E&A #116), was carried forward from 1947 on a 20-shift per week basis to the start of ore season, on the last of April. A new program, (E&A #137), was started in May and conducted concurrently with ore movements with whatever equipment could be spared by the ore operations. Post-season stripping was hampered by lack of shovel capacity, until stockpile loading and sump excavation were completed in the last half of October. When available, two shovels were used on 20-shift per week schedules, until November 15th, when the prevailing power shortage necessitated cutting out one shovel on the afternoon shift, but a 21-shift week was effected and carried through to the end of the year. Practically all the pre-season stripping was in the northeast corner rock area of the Brown #2. The new program consisted of additional north extensions of Brown #2 and southerly pit extensions involving both the Holman and Brown #2 leases.

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1948

1. GENERAL:
(Continued)

Exploratory drilling was carried on throughout the year, under contract with the J. S. Schultze Company, until June, when a Mesaba-Cliffs drill became available to carry on the work. The exploration justified the north extension of the Brown #2 and sample holes were drilled in the pit bottom enveloping the Holman and Brown #2 forties.

Repairs to equipment were conducted throughout the year.

Considerable construction work took place during the year. The Fine Ore Plant (E&A #MC-113), the Central Warehouse (E&A #CC-214), and the Cold Storage Garage near the shops and the Pit Service Garage (E&A #MC-121), all of which were started in 1947, were completed in 1948. A pilot plant of spirals (E&A #MC-127), was erected at the washing plant during the ore season. The erection of the Heavy Density Plant (E&A #MC-114), got underway and was still in progress at the close of the year, under contract with the Western-Knapp Company.

2. PRODUCTION, SHIPMENTS & INVENTORIES:

a. Production by Grades:

Holman Crude,	474,045	tons ✓
Brown Crude,	930,436	" ✓
Total Holman-Brown Crude,	1,404,481	" ✓
Mesaba-Cliffs Fines Crude,	278,465	" ✓
Holman Bessemer Concentrates,	158,330	" ✓
Holman Non-Bessemer Concentrates,	151,225	" ✓
Brown Bessemer Concentrates,	209,775	" ✓
Brown Non-Bessemer Concentrates,	387,466	"
Total Production,	906,796	" ✓
Mesaba-Cliffs Fines Produced,	87,006	" ✓

b. Shipments:

Holman Bessemer Concentrates,	158,330	" ✓
Holman Non-Bessemer Concentrates,	151,225	" ✓
Brown Bessemer Concentrates,	209,775	" ✓
Brown Non-Bessemer Concentrates,	385,661	" ✓
Mesaba-Cliffs Bessemer Fines,	30,455	" ✓
Mesaba-Cliffs Non-Bessemer Fines,	55,963	" ✓
Total Shipments,	991,409	" ✓

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1948

2. PRODUCTION, SHIPMENTS & INVENTORIES:

c. Inventories:

The season began with a Brown stockpile total of 52,814 tons, all of which were subsequently shipped during the year. A new stockpile of 54,619 tons of Brown ore was made, and the season closed with this amount in the pile.

d. Production by Months:

(1) Crude Ore:

	HOLMAN	BROWN	M-C FINES	TOTAL
April, ----------		3,773		3,773
May, ----------	77,674	128,015		205,689
June, ----------	79,297	183,989	41,250	304,536
July, ----------	92,178	173,845	62,219	328,242
August, ----------	123,284	119,409	67,944	310,637
September, ----------	50,817	216,106	72,038	338,961
October, ----------	50,795	105,299	35,014	191,108
Total, ----------	474,045	930,436	278,465	1,682,946

(2) Concentrates:

April, ----------		2,310		2,310
May, ----------	49,548	81,082		130,630
June, ----------	53,164	123,714	8,538	185,416
July, ----------	61,931	116,055	23,001	200,987
August, ----------	79,649	70,060	20,378	170,087
September, ----------	33,613	140,592	26,006	200,211
October, ----------	31,650	63,428	9,083	104,161
Total, ----------	309,555	597,241	87,006	993,802

f. Ore Statement:

As of the end of the year, there were 54,619 tons of Brown ore in stockpile and 588 tons of Mesaba-Cliffs Fines in stock. The 52,814 tons of stockpile from 1947 was loaded out during April of 1948. During the ore season, a total of 142,873 tons of Brown #2 concentrates was stocked, of which 88,254 tons were shipped post-season, leaving a balance of 54,619 tons in stockpile for early 1949 shipment.

3. ANALYSIS:

a. Tonnage and Analysis of Crude Ore:

	Tons	Iron	Phos.	Silica
Holman, ----------	474,045	40.69	.035	36.28
Brown, ----------	930,436	40.72	.037	36.47
	1,404,481	40.71	.036	36.41
Mesaba-Cliffs Fines, ------	278,465	36.29	-	44.65

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1948

3. ANALYSIS:
(continued)

b. Tonnage & Analyses of Concentrates Produced:

	Tons	Iron	Phos.	Silica	Mang.	Alu.	Moist.	Iron Nat.
Holman Bess. Conc.	158,330	56.20	.035	13.59	.17	.38	7.12	52.20
Holman N.B. Conc.	151,225	56.28	.050	12.35	.16	.40	7.02	52.33
Brown Bess. Conc.	209,775	56.47	.037	13.15	.16	.40	6.97	52.53
Brown N. B. Conc.	387,466	56.12	.051	12.71	.16	.39	6.85	52.28
Total,	906,796	56.24	.045	12.91	.16	.39	6.95	52.33
Mesaba-Cliffs Bess. Fines,	30,455	58.98	.028	11.94	.18	.42	7.55	52.53
Mesaba-Cliffs N.B. Fines,	56,551	58.53	.029	12.51	.20	.42	7.76	53.99
Total Fines,	87,006	58.69	.029	12.31	.19	.42	7.69	54.18

c. Tonnage & Analyses of Concentrates Shipped:

Holman Bess.Conc.	158,330	56.20	.035	13.59	.17	.38	7.12	52.20
Holman N.B.Conc.	151,225	56.28	.050	12.35	.16	.40	7.02	52.33
Brown Bess.Conc.	209,775	56.47	.037	13.15	.16	.40	6.97	52.53
Brown N.B.Conc.	385,661	56.20	.052	12.56	.16	.40	6.77	52.40
Total,	904,991	56.28	.045	12.84	.16	.40	6.92	52.39
Mesaba-Cliffs Bess. Fines,	30,455	58.98	.028	11.94	.18	.42	7.55	54.53
Mesaba-Cliffs N.B. Fines,	55,963	58.52	.029	12.52	.20	.42	7.77	53.97
Total Fines,	86,418	58.68	.029	12.32	.19	.42	7.69	54.17

d. Tonnage & Analyses of Ore in Stockpile:

Brown N.B. Conc.	54,619	56.06	.045	13.02	.15	.36	6.91	52.19
Mesaba-Cliffs Fines	588	59.19	.029	11.92	.18	.42	7.28	54.88
Total,	55,207	56.09	.045	13.01	.15	.36	6.91	52.22

e. Complete Analyses of Season's Shipments:

	Iron	Phos.	Sil.	Mang.	Alu.	Lime	Mag.	Sul.	Loss
Holman Bess. Conc.	56.20	.035	13.59	.17	.38	.27	.17	.012	4.90
Holman N.B. Conc.	56.28	.050	12.35	.16	.40	.26	.18	.010	5.99
Brown Bess. Conc.	56.47	.037	13.15	.16	.40	.27	.16	.011	4.95
Brown N.B. Conc.	56.20	.052	12.56	.16	.40	.26	.17	.010	5.99
Mes-Cliffs Bess.Fines	58.98	.028	11.94	.18	.42	.26	.17	.011	2.55
Mes-Cliffs N.B.Fines	58.52	.029	12.52	.20	.42	.26	.17	.011	2.59

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1948

4. ESTIMATE OF ORE RESERVES:

a. Developed Ore:

Factors:

	Cu. Ft. Per Ton Crude	% Rock Deduction	% Recovery
Merch. Ore,	13	10	100.00
Wash Ore,	14	-	59.65
Lean Wash,	15	-	47.35
Low Grade Wash,	14	-	57.86
Lean Low Grade Wash,	15	-	45.10
Retreat Ore,	14	-	37.33

	Reserve 12-31-47	Mined 1948	Balance After Mining	Changed by Re-Estimate	Reserve 12-31-48
North Star					
N½-NE¼ 21,56-24	666,564	-	666,564	-	666,564
Bingham:					
NW-SE 21,56-24	911,764	-	911,764	-	911,764
Holman:					
SE-NE 21,56-24	2,438,918	309,555	2,129,363	-	2,129,363
Brown No.1:					
SW-NE 21,56-24	575,829		575,829	-	575,829
Brown No.2:					
SW-NW 22,56-24	2,933,014	597,241	2,335,773	-	2,335,773
Grand Total,	7,526,089	906,796	6,619,293	-	6,619,293

b. Prospective Ore:

It is expected that there will be a sizeable increase in the reserves at the Holman-Cliffs Mine through drilling on the north side of the Brown #2 and through the inclusion of some marginal retreat ore in Brown #1, Brown #2 and the Bingham. A new reserve estimate is now being made on this property and should be completed sometime in June or July of 1949.

c. Estimated Analyses of Ore Reserves:

	Tons	Iron	Phos.	Sil.	Mn.	Al.
North Star-Bingham:						
Bessemer Direct,	3,125	57.73	.032	13.36	.32	3.20
Non-Bessemer Direct,	30,322	57.84	.050	12.42	.30	3.50
Bess. Wash Concs.	529,677	58.96	.032	10.15	.17	.51
Non-Bess. Wash Conc.	629,686	57.59	.057	10.82	.28	.54
Bess. Retreat Concs.	131,586	58.50	.040	10.50	.16	.40
Non-Bess.Retreat Conc.	253,932	58.00	.050	11.00	.24	.41
Total N.Star-Bingham,	1,578,328	58.20	.046	10.63	.23	.56
Holman-Brown:						
Bess.Wash Concs.	1,497,819	59.26	.030	9.53	.18	.41
Non-Bess. Wash Conc.	827,314	57.84	.059	10.03	.15	.54
Bess.Retreat Conc.	817,665	58.50	.038	10.50	.16	.40
N.B.Retreat Conc.	1,898,167	58.00	.050	11.00	.16	.40
Total Holman-Brown,	5,040,965	58.43	.044	10.32	.16	.43

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1948

4. ESTIMATE OF ORE RESERVES:

c. Estimated Analyses: (Continued)

	Tons	Iron	Phos.	Sil.	Mn.	Al.
Total Direct,	33,447	57.83	.048	12.51	.30	3.47
Total Bess. Wash Conc.	2,027,496	59.18	.031	9.69	.18	.44
Total N.B. Wash Conc.	1,457,000	57.73	.058	10.37	.21	.54
Total Wash Concts.	3,484,496	58.58	.042	9.97	.19	.48
Total Bess. Retreat Concentrates,	949,251	58.50	.038	10.50	.16	.40
Total Non-Bess. Retreat Concentrates	2,152,099	58.00	.050	11.00	.17	.40
Total Retreat Concts.	3,101,350	58.15	.046	10.85	.17	.40
Total Bessemer,	2,979,872	58.96	.033	9.95	.17	.43
Total Non-Bessemer,	3,639,421	57.89	.053	10.76	.19	.48
Grand Total,	6,619,293	58.37	.044	10.39	.18	.46

5. LABOR & WAGES:

a. Comments:

There was some fluctuation in the supply of labor during the year. At times, men were looking for work; then, again, there were periods of labor shortages, but the shortages never reached acute stages. In August, a 9-1/2 per cent general raise in wages became effective and retroactive to July 16, 1948.

b. Comparative Statement of Wages & Product:

Production:

Wash Concentrates,	906,799 tons
Fines,	87,006 "
Total,	993,805 "
Number of Days Operated,	130
Average Number of Men Working,	207
Average Wages Per Day,	$11.59
Product Per Man Per Day (tons)	28.85
Labor Cost Per Ton,	$.410
Total Number of Days,	34,452
Amount Paid for Labor,	$407,537.69

6. SURFACE:

a. Buildings, Repairs:

A total of $12,002.87 was expended during the year in maintenance of the office, shops and the 58 rented houses in Taconite. This work consisted of foundation replacement, exterior painting and normal maintenance work.

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1948

6. SURFACE:
(Continued)

b. Roads, Transmission Lines, etc:

In addition to the constant shifting and re-building of roads for pit and dump operations, about 2,000 feet of new roads were constructed to skirt the northeast pit extensions.

A re-routing of about 1,200 feet of transmission line to the central pit bottom, was necessitated by the south side stripping program. A new "A" frame span, of about 500 feet, was dropped into the pit over the east end, for better load distribution with concurrent ore and stripping movement. At the fine ore plant, about 600 feet of transmission line was constructed for sump drainage.

c. Miscellaneous General Construction:

A 2,400-foot ditch was dug along highway 169 to release the high water impounded by the Holman tailings basin, involving the laying of 66 feet of 24 inch culvert under the D. M. & I. R. Railway and about 230 feet of lesser culverts under the adjacent secondary roads. About 800 feet of 16 inch pipe was laid in conjunction with new sump developments in the pit bottom, and about 1,700 feet of new lines were re-routed over the north bank to clear the northerly stripping extensions. A concrete slab for wash rack was laid and housed near the repair shop to facilitate cleaning of mobile units and motors. The recent relocation of the washing plant, with its pipeline, wiped out the old Taconite ball park. A new ball park was constructed during the year, involving fills, grading and drainage.

7. OPEN PIT:

a. Stripping:

Stripping operations were carried forward throughout the year on two separate E&A programs, MC-116 and MC-137. A grand total of 1,690,128 cubic yards of overburden was removed, exclusive of 20,124 tons of wash ore sorted out of the east end stripping in January and stocked in the pit; 24,256 cubic yards of rock, moved to stabilize the pit conveyor washout in April, and 74,580 tons of low grade wash ore excavated and stocked in the pit in post-season sump work.

The pre-season stripping program was continued from 1947 on a 20-shift per week basis and brought to a close on the last of April, with the start of the ore season. This program entailed the movement of hard taconite, blocky paintrock and some lean material from the east end Brown #2 area, and an island of float taconite from the pit bottom with some spring clean-up from both the Holman and Brown forties. During the four-month period of pre-season stripping, about ten days were lost to layoff periods, due to sleet storms, shovel breakdowns, and spring breakup. On 293 shifts of operation, a total of 493,881 yards of overburden was removed, showing an average movement of 1,686 yards per shift, at a cost of $.576 per yard. Costs were extremely high, due to the rundown condition of the old 120-B shovels, the hard

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1948

7. OPEN PIT:
(continued)

a. Stripping: (continued)

and blocky material handled and the heavy inflow of water through numerous springs over the entire area. Two-shovel operations were attempted in this work, but frequent major shovel failures made it impossible and, when the newest shovel, the #57, cracked a side casting early in March, single-shovel operations were scheduled thereafter. An intermediate sump was dug in the east end, above the main bottom, to trap the same heavy flows at a higher elevation and reduce the lower pit bottom drainage. The sump work was slow, with only one shovel available, and truck haulage was retarded considerably over the steep and slippery paintrock bottoms. Stripping operations were brought to a standstill for a seven day period in April, when a washout began, undermining the main pit conveyor. All the available equipment was used to load and haul rock into the erosion channels. Starting at the toe for a vertical distance of 110 feet to the conveyor sills, a total of 24,259 yards of rock was hauled to stabilize the conveyor. The steep grades over the rock and mud, involved by this emergency fill, crippled the truck fleet considerably, just before the start of the ore season.

The emergency work delayed the bottom clean-up stripping, and ore production was held down to 2-shift operations for the first half of May, to catch up on the necessary clean-up work; however, the yardage moved during this time was charged to mining and the second stripping program did not get underway until the 24th, with the delivery of five new Terra-Cobra self-loaders.

Since no equipment could be spared from ore operations, the new stripping program got off to a slow start. Cobra operators were broken in and, with the erection of the new Marion shovel on June 19th and the delivery of bottom dump trucks, bottom-dump operators had to be broken in, consequently the ultimate schedule of 3-shift operations on alternate 5 and 6 day per week was not reached until the first of July. With the close of the ore season on October 16th, the stripping schedule was stepped up to 20 shifts per week and for a wider distribution of power during the electrical shortage, to a 21-shift per week on November 15th. Both the north and south extensions of the pit were made under this program, involving the removal of surface blocky taconite, with some lean material in the north Brown #2 area, and mainly surface material from the Holman and Brown #2 forty on the south side. A total of 461 shifts of operations was operated and 1,196,247 yards of all material were removed, showing an average of 2,595 yards per shift, at an average cost of $.301 per yard. This cost is an average of extremely variable conditions. The Cobras moved very little surface and all during the breaking-in period, showed an average production of 1,363 yards per shift, at a cost of $.247 per yard. The single shovel stripping operation during the ore season, using the new Marion 5-yard shovel and the new bottom-dump haulage trucks, maintained an average output of 2,151 yards per shift and varied between costs of $.210 in surface to about $.320

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1948

7. OPEN PIT:
(Continued)

a. Stripping: (continued)

per yard in taconite. The post-season stripping of taconite mainly, using 2, 1 and 2 shovels respectively on the three shifts, showed an average output of 3,685 yards per shift, at a cost of $.349 per yard.

The program, in general, was hampered by numerous slides in the soft clay and quicksand banks on the north side, either partially burying the shovel or necessitating shifting to more stable areas. The program was further delayed in adjustments and mechanical defects which developed in the new shovel and by the heavy drilling and blasting necessary to break up the solid taconite and blocky paint rock. However, despite the increased cost, due to the above, the average cost of moving approximately 1,200,000 yards in the new program, was only $.301 per yard, as compared with a cost of $.576 per yard in the previous program. The investment in additional stripping equipment to permit mining and stripping concurrently was, therefore, warranted.

The following tabulation shows the yardage of the stripping materials removed from the various underlying leases during the year:

	Surface	Waste	Lean Ore	Paintrock	Taconite	Total
Brown #2	571,631	62,502	52,125	154,174	414,418	1,254,850
Holman	432,600	2,318	360	-	-	435,278
Total	1,004,231	64,820	52,485	154,174	414,418	1,690,128

b. Open Pit Mining:

The 1948 ore season was started with a single shift trial run of the plant on April 30th, and 2-shift operations during the first half of May, while pit clean-up was still in progress. Thereafter, the working schedules were alternated weekly on 5 days at 3 shifts per day and 6 days at 2 shifts, until the close of the ore season on October 16th. On 315 shifts of operation, a total gross crude of 1,488,855 tons was mined, showing an average output of 4,727 tons per shift. Of the gross crude, 84,373 tons of rock were scalped at the screening plant and hauled out of the pit, leaving a net crude to the mill of 1,404,481 tons, which produced 906,796 tons of concentrates, reflecting an average weight recovery of 64.56 per cent. The proportions of net crude by leases was 930,436 tons from the Brown #2 and 474,045 tons from the Holman.

Mining was conducted throughout the season, using two shovels with seven or eight trucks, as hauls required. Outside of a small amount of crude from the upper horizon, on the northeast corner of the Brown #2, operations were confined pretty much to the wet pit bottom. The breakdown of the #57 shovel, early in March, prevented the pre-season sump excavation, consequently most of the bottom ore was mined at water elevation, along with sump development.

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1948

7. OPEN PIT:
(Continued)

b. Open Pit Mining:

An attempt was made to absorb the huge bank of newly-stripped limonite in the east end, but the grade was too low and the whole area had to be hauled to the retreat pile to release the lower ore for further sump extension. The bottom ore was considerably lower in grade than indicated by structural drilling, consequently none of the upper ores could be absorbed to boost production. The heavy taconite seams in the lower horizon required continual sorting to reduce the high silica ratios. Also, to combat the high silica, a finer screen was installed at the screening plant which, due to the matting of wet ore over the finer openings, reduced production to about two-thirds normal, until a rock by-pass was installed at the mill and the lower screen reverted back to the original openings. A satisfactory control of phosphorous was maintained throughout the season for Bessemer and non-Bessemer requirements.

Over and above the 84,373 tons of rock rejects scalped at the screen, a total of 279,778 tons of other lean material was removed from the ore areas. This lean material movement took place while sorting at shovels during the ore operations and, on 81 shifts of free nights and week-ends, and consisted of 40,224 tons of pit rock, 38,310 tons of lean ore, 149,716 tons of retreat and 51,528 tons of other waste material, with the rock and waste being hauled out of the pit to the north dumps. Due to the long haul out of the pit and heavy rock movement at times, it was necessary to use two trucks on the rock haul. This additional lean material was removed for about $.155 a ton and amounting to .31 tons to every ton of concentrates, added almost $.050 to the cost of each ton of concentrates produced.

Since the lack of equipment prevented the development of a deep sump previous to the ore season, it was necessary to develop deep sumps in the pit bottom as the mining was carried downward.

As a result of the above retarding factor, the net crude ore output averaged 4,459 tons per shift as compared with an estimated production of 5,000 tons. The cost of mining was increased considerably by the extra work in sump development and pumping and drainage, and by the large tonnage of lean and waste material which was moved in connection with the ore operations.

c. Pumping and Drainage:

During the spring stripping, an intermediate sump was excavated in the upper horizon of the east end, with the bottom in the impervious paintrock layer to trap most of the heavy springs in that area and reduce the volume of pumping at the bottom elevation. An average of about 500 G.P.M. was caught and pumped over the east end throughout the season. Following sump developments, during the ore operations, about 800 feet of 16 inch pipe extensions were made and about 1,700

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1948

7. OPEN PIT:
(Continued)

c. Pumping and Drainage: (continued)

feet of 16 inch discharge was re-routed over the north bank to replace the former line which was removed for the northeast stripping extensions. The third sump, concurrent with ore operations, which was just started at the close of the ore season, was completed on 18 shifts of post-season work. One shovel, serviced with two to four trucks, was used to remove 74,580 tons of low grade wash ore to the pit dumps and the sump was completed to the 405-foot elevation in the southeast corner of the pit. The last sump was completed to eliminate the repetition of water problems next year, but the expenses were charged to 1948 operations. The added expenditures created by the above mentioned problems, together with the expense of continual secondary pumping for shovel operations in sump developments, almost doubled the normal pumping costs, as revealed by the accumulated cost of $.061 per ton of concentrates.

Retreat ore developments next year, on the north side, will necessitate the removal of the north discharge line. Two new high-head pumps, bought and paid for in 1948, will be installed in the east end, with a new 16 inch discharge over the east end for pit drainage and branched connection to the clear water reservoir at the plant for additional water required by plant extensions. This new hook-up will reduce by two pumps the total requirements of the present arrangement.

d. Other General Pit Activities:

The emergency rock movement in April, to fill the washout under the pit conveyor, was conducted under difficult conditions. About $12,000 was expended in stabilizing the area, which absorbed in winter and idle expenses.

8. BENEFICIATION:

a. Washing Plant:

The washing plant operated on schedules established for the pit from April 30th to October 16th. On 315 shifts of operation, a total of 1,404,481 tons of net crude was treated, with 1,555 tons of rock rejected at the lately installed by-pass, to produce 906,796 tons of concentrates, showing an average weight recovery of 64.56 per cent. The average production averaged 2,879 tons of concentrates per shift, at a cost of about $.120 per ton, which was over $.010 higher than anticipated, due to the slow feed of wet ore and extra expenditures involved by ball park work and experimentation in an effort to lower silica with fine screening, by-passing, and spiral installations.

Outside of the retarded feed, the mill operated very satisfactorily, with composite delays for the season amounting to only three hours in electrical repairs and 41 hours encountered in mechanical delays, a large percentage of which comprised of experimental changes, and about a 30-hour total loss in power shortages, ore shortages and loading facility delays.

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1948

8. BENEFICIATION:
(Continued)

a. Washing Plant (Continued)

A large accumulated total of 438 hours for periods of railroad car shortages entailed the stocking of 142,873 tons of Brown #2 concentrates. The stockpile trestle was extended west for the isolation of Bessemer grades which increased the stocking area, but beyond the 100,000-ton capacity, stocking expenses increased rapidly because two bulldozers were required for stockpile disposal and more than one was not always available.

b. Fine Ore Plant:

With the completion of the fine ore plant erection, operations were started on June 12th, on a single shift basis and, as machine operators were broken in, stepped up to a 3-shift production by the 21st. At the start, the schedules were alternated on the 5 and 6-day week, but, to compensate for the late start, the straight 6-day week was made effective in August, until the termination of operations on October 12th. On 283 shifts of operation, a total of 278,465 tons of crude tailings was treated to produce 87,006 tons of concentrates, showing an average weight recovery of 31.24 per cent. The feed and output averaged 984 and 307 tons per shift, respectively. For a comparatively new field of concentrate recovery, the plant operated quite satisfactorily and good iron grades were realized at an average operating cost of $.646 per ton of product.

About 90 hours were lost to production during the season in plant delays involving some progressive remodeling through accumulated experience, some electrical and mechanical failures of the equipment, especially the screens and frequent plugging of hoppers and screens because of the wet material handled.

A 54-B, 2-1/2-yard dragline was used to load the crude tailings on the field conveyors to feed the plant. About 75 hours in delays were encountered during the season in running repairs to the dragline. Four and a half dragline cuts were made along the field conveyors, involving four moves of the conveyor line. Major plant and shovel repairs were conducted during the conveyor moves and an old rock reject baffle dyke, amounting to about 7,000 cubic yards, was moved off the crude tailing area during the period of plant delay.

The dragline was used prior to ore operation, to build a 2400-foot dyke encircling the crude area to keep out the washing plant tailing water. Intermittent pumping over the dyke throughout the season maintained a low water level in the area worked. The dyke was again raised subsequent to ore production, and 12,540 tons of crude, inaccessible to the present conveyors, were hauled into working range by the Terra-Cobra self-loaders.

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

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1948

8. BENEFICIATION:
(Continued)

5' x 14' Screen Rejects

Lease	Tons	Iron	Phos.	Silica
Holman	30,380	33.31		
Brown	53,993	32.80		
Total,	84,373	32.98		

The rock removed from the pit was as follows:

Lease	Tons	Iron
Holman	7,647	35.26
Brown	35,655	32.29
Total,	43,302	32.82

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

	Tonnage	% Total Mined	% Iron Dried	Tonnage Recovery	Iron Unit Recovery
Crude Ore and Rock Mined	1,532,156	100.00	40.06		
Less: Rock Removed in Mining	43,302	2.82	32.82		
Crude Ore transported to mill	1,488,854	97.17	40.27		
Less: Rock Rejects in Screening Plant,	84,373	5.51	32.98		
Crude Ore Entering Mill	1,404,481	91.66	40.71		
Concentrates Produced	906,796	59.18	56.24	64.56	89.19
Rock Rejects on Mill Picking Belt	-	-	-		
Tailings (By Deduction)	497,685	32.48	12.41		
Total as above,	1,404,481	91.66	40.71		
Mesaba-Cliffs Fines - Crude to Mill,	278,465		36.29		
Mesaba-Cliffs Fines Produced	87,006		58.68	31.25	50.52

9. MAINTENANCE AND REPAIRS:

All washing plant machines were repaired prior to the ore season, with some remodeling of feeders after the first year of operation at the new plant location. Repairs were started anew after the 1948 season. Due to the age of the old Bucyrus-Erie and the continuous operations, maintenance repairs were heavy and complete overhauls were made when absolutely necessary between February and October. Defective electrical equipment and the bucket on the new Marion resulted in a large amount of repair work for a new shovel. The blocky taconite hauled during the pre-season stripping, the crippling affect of the emergency rock fill, together with the abrasive wear of water and ore in the pit bottom during the ore season, entailed a heavy truck maintenance program throughout the year and truck availability was constantly at a critical stage. Repairs to drills, graders and tractors were carried on continuously.

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1948

10. COST OF OPERATION:

a. Comparative Mining Costs:

	1948 BUDGET ESTIMATE	1948 COST	1947 COST
Product:			
Concentrates, (tons)	900,000	*993,805	768,192
Average Shift Production:			
Washing Plant (tons)		2,879	2,663
Tons Per Man Per Day:			
Washing & Fine Ore Plants (tons)		28.85	29.81
Days Operated		130	102
Cost:	Per Ton	Per Ton	Per Ton
Fine Ore Concentrates,		$ .646	$
Open Pit Wash Ore,	$ .287	.389	.292
General Open Pit Expense,	.099	.140	.100
Concentrating,	.103	.121	.108
Stocking & Loading Concentrates,	.007	.012	.002
General Mine Expense,	.126	.122	.132
Winter and Idle Expense,	.183	.280	.289
Cost of Production,	$ .805	$1.055	$ .923
Depreciation, Plant & Equipment,		.166	.067
Depreciation, Motorized Equipment,		.130	.044
Amortization of Stripping,		.356	.309
Taxes - Ad Valorem,		.124	.150
Taxes - Occupational,		.092	.127
Taxes - Royalty,		.025	.016
Amortization of Leasehold,		.192	.192
Total Cost at Mine,		2.140	1.828
Administrative Expense,		.100	.100
Miscellaneous Expense and Income,		.017	.009
Grand Total,		$2,223	$1.919

* Includes 87,006 Fine ore concentrates.

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1948

10. COST OF OPERATION: (Continued)

b. Detailed Cost Comparison:

(1) Product:

The natural iron grade of the concentrates produced in 1948 was not much lower than the 1947 product, but, due to the blockier crude treated, the silica increased more than a per cent. The inability to wash out the frozen silica resulted in a higher weight recovery for 1948. The 1948 natural iron silica and recovery were 52.30 -12.91 -64.56, respectively, as compared with 52.68 -11.88 -63.72 of the previous year.

(2) Open Pit Mining:

Under the crude ore caption, the 1948 cost exceeded the budget by $.102 and was $.097 higher than the 1947 cost. Due to the blocky material handled in 1948 and the large amount of lean material unable to be absorbed in the crude, but necessarily removed, the drilling and blasting costs almost doubled. The continual sump developments and wet ore operations decreased the efficiency of shovel and truck operations and the resultant abrasion increased maintenance costs considerably.

(3) General Pit Expense:

This caption for 1948 showed an increase of $.040, due to a 25 mill increase in pumping and drainage, and about a 15-mill increase in additional lean material movement.

(4) Concentrating:

The budget for concentrating was estimated at 5 mills under the 1947 cost of $.108; however, a 13-mill increase was realized in the actual costs for 1948. Nominal variations were noted in the various items, except in maintenance of building and machinery, where a 12-mill overrun occurred, due to the spiral installation with the necessary pumps and classifiers, and the installation of the by-pass with conveyor and rock pocket.

Stocking and Loading Concentrates:

The 1947 cost was $.002, as proportioned against the total product. In anticipation of greater stockpile handling, the budget was set at $.007, but, due to greater than anticipated amount stocked and re-loaded, the actual cost amounted to $.012 per ton of production. To accommodate the large stockpile, the trestles were extended and beyond the trestles, two bulldozers were required for further extension. The doubling up, due to loading and stocking, involved a total handling of 285,746 tons of concentrates.

(5) General Mine Expense:

Under this caption, the 1947 cost per ton was $.132 and was budgeted at $.126. A further saving of 4-mills was realized with an actual cost of $.122 per ton.

(6) Winter and Idle Expense:

This item was $.289 per ton in 1947 and was estimated at $.183 in the budget. The actual cost for 1948 was $.280 per ton, reflecting

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1948

10. COST OF OPERATION: (Continued)

b. Detailed Cost Comparison: (cont'd)

(6) Idle and Winter Expense: (Continued)

a 97-mill increase which is more than accounted for by the accumulated extra expenses.

11. EXPLORATION AND FUTURE EXPLORATION:

During the year, a total of 3,399'-5" of structural drilling was accomplished, of which 3,102'-10" was in the Brown #2 forty and 296'-7" in the Holman. The J. S. Schultze Drilling Company drilled 2,418'-10", while 980'-7" was drilled with the Company outfit.

Of the total, 1942'-8" was sample drilling in and about the Brown and Holman pit bottom to guide the season's operations and probe the depth of ore formation. The remaining 1,456'-9" of drilling consisted of exploratory holes in the north side of the Brown #2, to justify the northeast pit extensions.

In general, the explorations showed slight improvements in grade in the interpolated horizons and showed extensions of shorelines for additional tonnage, but of the lower grade, or retreat ores.

During 1949, it is planned to probe further the northeast extensions and to explore more thoroughly the high bank formation along the south property line.

12. TAXES:

The following is a statement of the taxes for the years 1948 and 1947:

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1948

12. TAXES:
(Continued)

	1948	1947	Increase	Decrease
Holman-Brown Mine	$78,375.16	$81,109.80		$2,734.64
Bingham Mine	16,308.02	14,354.48	$1,953.54	
North Star Mine	8,474.22	7,419.11	1,055.11	
Test Laboratory & Truck Shop	964.82	1,018.19		53.37
Washing Plant Site	4,364.19	56.06	4,308.13	
Auxiliary & Dump Lands	510.32	3,059.66		2,549.34
Holman-Cliffs Shops & Office and Fuel Oil Plant	415.75	376.60	39.15	
Holman-Cliffs Personal Property	6,585.31	7,904.11		1,318.80
Holman-Cliffs Fine Ore Plant	834.27	-	834.27	
Holman-Cliffs Tailings Basin Fines, Personal Property Tax,	7,221.25	not taxed 1947	7,221.25	
Total,	$124,053.31	$115,298.01	$8,755.30	
Rented Buildings,	1,179.15	1,078.50	100.65	
Grand Total,	$125,232.46	$116,376.51	$8,855.95	
Average Tax Rate	117.90	124.59		6.69

There has been a general increase of 20% in the 1948 classified rates, applying to ad valorem taxes on open pit mines, in Itasca County, as compared to those used in 1947. This is the result of the State Tax Commissioner having adopted the "Present Worth" or "Formula" method of valuing open pit ore bodies. The increase in Itasca County was more or less arbitrarily applied, being based on an average increase of 20% found in using the "Formula" method, on sixty open pit mines in St. Louis County. Although there was a general protest against the method and manner of setting up the new valuations, it has been fixed on that basis for 1948.

The reduction in reserve tonnage, due to shipments, resulted in a decrease in taxes, on the Holman-Brown Mine, regardless of the fact that there was a 20% increase in the classified rates for the mineral valuation in 1948. Also, the mill rate is lower in 1948 than in 1947.

The increase in taxes on the Bingham and North Star Mines is the result of the 20% raise in the classified rates for mineral valuations. No ore was shipped from these properties in 1948.

The small reduction in taxes on the Truck Shop and Test Laboratory is accounted for by the reduction in the tax rate.

The substantial increase in taxes on the Washing Plant Site is due to the moving of the plant to this property during the winter months of 1947.

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1948

12. TAXES:
(Continued)

The decrease in taxes on Auxiliary and Dump Lands is the result of moving the washing plant from one of the forties in this group.

A new item of taxes appears, to cover the Fine Ore Plant erected in the winter of 1947-1948.

With the first year's operation in recovering fine ore from the tailings basin, a value was placed on this material, for personal property tax purposes, in that part of the basin which is rich enough for treatment.

The increase shown for Shops, Office and Fuel Oil Plant is due to the Assessor's higher valuation on that property.

The smaller amount of taxes paid in 1948 is accounted for by a reduction in value of personal property.

The reduced tax rate of 117.90 mills for 1948, as compared to 124.59 mills for 1947, is accounted for by the fact that the County rate is down 6.07 mills, and also, an increased mineral valuation in connection with per capita limitation for levying taxes, has the effect of lowering the mill rate.

13. ACCIDENTS AND PERSONAL INJURY:

The accident record showed five compensable accidents encountered during the year, involving 74 days of lost time. Non-compensable accidents totaled twelve for an additional 28 days of lost time. The Safety Departmentis continually on the job and endlessly recommending improvements to better the safety record.

14. PROPOSED AND NEW CONSTRUCTION:

Of major importance in the immediate future is the spiral installation at the washing plant to recover the fine values now being pumped out with the tailings. The experiment with the pilot plant during the 1948 ore season justifies this installation. Included also is the completion of the high density plant which will be ready for the 1949 operation. An abrasion grinding circuit will have to be installed in late 1949 or 1950 to handle retreat ore under 1/8" size.

HOLMAN-CLIFFS MINE
ANNUAL REPORT
YEAR 1948

15. EQUIPMENT RECEIVED AND PROPOSED NEW EQUIPMENT:

Listed below is the new equipment purchased for this property during 1948:

1 - Moline Industrial Tractor - Lull Loader
1 - D-8 "Caterpillar" Tractor
1 - HD-19 Allis-Chalmers Tractor
6 - Bottom-Dump Euclid Trucks
5 - Terra Cobra Wooldridge Trucks
1 - 1948, 1/2-ton Ford Pick-up Truck
2 - KB-1 International Trucks
1 - Type 4161, 5-yard Marion Electric Shovel
1 - Bucyrus-Erie 27-T Drill
1 - Complete Set of Structural Drill Attachments
2 - Ingersoll-Rand 1500 G.P.M. Hi-Head Pumps with 150 HP Motors
1 - Allis-Chalmers 10 x 8 Solids Pump with 75 H.P. Motor
1 - Rex Self-Priming Portable Gasoline-Driven Pump
12 - 5-Turn Spirals and 2 - 3-Turn Spirals
1 - 36" Akins Classifier
1 - Hardinge Counter-Current Classifier
1 - 12' Dewatering Rotoscoope with 25 H.P. Motor
1 - 100C.Y. Butler Steel Ore Bin
1 - Allis-Chalmers 8 x 6 Solids Pump with 50 H.P. Motor
2 - Allis-Chalmers 5 x 4 Solids Pumps with 15 H.P. Motors
4 - 10/15 H.P. Classifier Motors

On order for 1949 delivery are: Three additional 20-ton end-dump Euclid trucks; one #4161 Marion 5-yard Electric Shovel; one D-8 "Caterpillar" tractor and 28 additional spirals.

SARGENT MINE
ANNUAL REPORT
YEAR 1948

1. GENERAL:

Mining operations at the Sargent Mine were carried forward throughout the year on a two-shift, six day a week basis. In addition to shut-downs on holidays, one week was lost in November, and one week in December, when operations were suspended for necessary repairs. An average of eleven gangs were employed, with nine slicing and two on development work. During the early part of the summer, a tractor and scraper were employed cleaning up surface wash from the top of ore in the milling pit. During July, August, September and October, ore was produced from the mill pit, intermittently as bulldozer equipment was available.

From January 1st, to April 3rd, all ore produced was placed in stockpile. Loading into cars for direct shipment started on April 3rd, and loading from stockpile started April 6th, and was completed May 29th. Intermittent stockpiling was resumed on October 18th, and, with shipments completed on November 18th, all ore for the balance of the year was placed in stock.

2. PRODUCTION, SHIPMENTS & INVENTORIES:

a. Production:

Sargent,	370,256 tons.

b. Shipments:

Sargent,	390,896 "

c. Stockpile Inventories:

Sargent,	35,289 "

e. Production by Months:

January,	21,384 tons
February,	21,609 "
March,	24,648 "
April,	25,989 "
May,	27,142 "
June,	33,072 "
July,	46,649 "
August,	44,996 "
September,	45,975 "
October,	39,365 "
November,	21,553 "
December,	17,874 "
Total,	370,256 "

SARGENT MINE
ANNUAL REPORT
YEAR 1948

2. PRODUCTION, SHIPMENTS & INVENTORIES: (Continued)

f. Ore Statement:

Ore was loaded, both from the shaft and the milling pit during the regular season and both operations contributed to the accumulating of a stockpile balance of 35,289 tons.

3. ANALYSIS:

b. Tonnage & Analysis of Direct Ore Produced:

	Tons	Iron	Phos.	Silica	Mang.	Alum.	Moist.	Iron Nat.
Sargent,	370,256	55.59	.062	12.51	.61	1.94	13.01	48.36

c. Tonnage & Analysis of Ore Shipped:

Sargent,	390,896	55.67	.061	12.33	.63	1.93	13.01	48.43

d. Mine Analysis of Ore in Stockpile:

Sargent,	35,289	55.42	.060	12.31	.70	2.10	13.60	47.88

e. Complete Analysis of Shipments:

	Tons	Iron	Phos.	Sil.	Mang.	Alu.	Lime	Mag.	Sul.	Loss
Sargent,	390,896	55.67	.061	12.33	.63	1.93	.33	.21	.011	4.55

4. ESTIMATE OF ORE RESERVES:

a. Factors:

	Cu.Ft. Per Ton Crude	% Recovery
Merch. Ore,	14	100.00

b. Ore Reserves:

Non-Bessemer:

	RESERVE 12-31-47	MINED 1948	BALANCE AFTER MINING	RESERVE 12-31-48
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	695,144	157,531	537,613	537,613
SE-SE 23,57-22	476,507	137,050	339,457	339,457
NW-NE 26,57-22	228,502	75,675	152,827	152,827
Total,	1,817,640	370,256	1,447,384	1,447,384

SARGENT MINE
ANNUAL REPORT
YEAR 1948

4. ESTIMATE OF ORE RESERVES:

c. Analysis of Ore Reserves:

	Tons	Iron	Phos.	Sil.	Mn.	Alu.
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	537,613	56.58	.071	10.08	.83	2.53
SE-SE 23, 57-22	339,457	56.58	.071	10.08	.83	2.53
NW-NE 26, 57-22	152,827	56.58	.071	10.08	.83	2.53
Total,	1,447,384	56.97	.068	10.00	.84	2.21

5. LABOR & WAGES:

a. Comments:

The labor supply was plentiful throughout the year, but there was a shortage of experienced miners. However, a program of training was carried on continuously and no serious shortage was experienced. Labor relations with the Union were very good. There was a general wage increase in July.

b. Comparative Statement of Production and Wages:

Production:	
Direct Ore, ----------	370,256 tons
Number of Days Operated, ----------	296
Average Daily Product, ----------	1,251 tons
Average Number of Men Working, ----------	109-3/4
Tons Per Man Per Miner, ----------	30.10
Tons Per Man Total Underground, ----------	14.60
Tons Per Man Total Mine, ----------	11.02
Average Rate Per Day:	
Surface, ----------	$ 12.08
Underground, ----------	$ 13.51
Contract Miners, ----------	$ 14.86
Total Mine, ----------	$ 13.14
Amount Paid for Labor, ----------	$ 459,170.11
Labor Cost Per Ton, ----------	$ 1.240

6. GENERAL SURFACE:

a. Buildings, Repairs:

A program of light repairs, together with both interior and exterior painting of mine buildings, was carried on throughout the year. Due to the plaster being beyond repair in location house No. 6, the interior was entirely covered with plaster board and painted.

b. Roads, Transmission Lines, etc:

A new transformer station was installed on the east side of the engine house in connection with the use of an additional motor-generator set. New main power feed, with fuses and lightning arresters, was installed south of the engine house.

SARGENT MINE
ANNUAL REPORT
YEAR 1948

7. UNDERGROUND MINING:

a. Shaft:

Minor repairs were made to the shaft timbers.

b. Development:

No extensive development was necessary. A few short drifts and raises were put in to open up blocks of ore for mining.

c. Mining:

The regular method of mining was by top slicing, although one gang operated by sub-level caving method for approximately three months. This method proved very satisfactory, but the nature of the ore body made its use very limited. Mining operations entailed the mining back of pillars on various sub-levels in an orderly fashion. During the latter part of the year, one gang was started mining out the main level on the east side, so as to carry on this low production work along with other operations. All mining was carried on with the use of two 15 h.p. tuggers, with 60 inch scrapers in each place. One to move the ore from the slice and the other to deliver it to chutes to main haulage level. The average height of the slices were 14 feet. Widths were 10 and 12 feet, depending on the condition of the back.

During the year, considerable high silica ore was encountered. Rather than leave this material behind, where it would be impossible to recover, it was absorbed with lower silica ores, which accounts for the over-all higher silica shipped during the year, than was guaranteed. A complete study of the ore body is underway to determine the amount of this high silica material and the possibility of concentrating it.

The latter part of May, a tractor, with bulldozer and scraper, was started cleaning up surface wash on top of ore in the mill pit. This work was carried on intermittently as equipment was available from other mines, until the early part of July, when sufficient ore was cleaned to start production from the pit. This operation was carried on as equipment was available, until the end of October and 64,817 tons were mined and shipped from the mill pit. This operation entailed the pushing of ore with bulldozer from the pit into chutes which carried it to the main level and into tram cars on the main level to the shaft, where it was hoisted to surface.

d. Timber, Explosives, etc:

Although the cost of timber increased over previous year, the supply was ample and of good quality:

Lineal feet timber used per ton of ore produced,	0.77
Cost per ton for timber, lagging, poles, boards and wire,	$0.208
Cost per ton for explosives,	$0.066

SARGENT MINE
ANNUAL REPORT
YEAR 1948

7. UNDERGROUND MINING: (Continued)

e. Pumping and Drainage:

Only normal pumping conditions prevailed during the year and all pumps were completely overhauled. The cost per ton for pumping was $0.047.

8. COST OF OPERATION:

a. Comparative Mining Costs:

	1948 BUDGET	1948 COST PER TON	1947 COST PER TON
PRODUCT:			
Direct Ore,	256,000	370,256	147,411
UNDERGROUND COSTS:			
Milling Pit,	-	$ .049	-
Stoping,	$ .730	.605	$ .747
Timbering,	.520	.408	.541
Tramming,	.163	.148	.175
Ventilation,	.015	.007	.016
Pumping,	.100	.047	.098
Compressors and Air Pipes,	.040	.032	.049
Underground Superintendence,	.060	.043	.068
Cave-in or Fire in Mine,	-	-	.006
Maint: Compressors & Power Drills,	.015	.004	-
" Scrapers & Mechanical Loaders,	.050	.067	.055
" Tramming Equipment,	.025	.037	.016
" Pumping Machinery,	.002	.003	-
Total Underground Costs,	$ 1.722	$ 1.450	$ 1.771
SURFACE COSTS:			
Hoisting,	$ .045	$ .037	$ .051
Stocking Ore,	.020	.025	.035
Dry House,	.045	.030	.055
General Surface Expense,	.025	.019	.026
Maint: Hoisting Equipment,	.002	.004	.000
" Shaft,	.005	.004	.001
" Top Tram Equipment,	.001	.004	.000
" Docks, Trestles & Pockets,	.001	.000	.016
" Mine Buildings,	.002	.007	.000
Total Surface Costs,	.146	.130	.184
GENERAL MINE EXPENSE:			
Geological,	$ .001	$ .001	$ .001
Mining Engineering,	.025	.013	.026
Mechanical & Electrical Engineering,	.002	.008	.004
Analysis and Grading,	.015	.017	.014
Safety Department,	.006	.006 n	.009
Telephones & Safety Devices,	.005	.008	.010

SARGENT MINE
ANNUAL REPORT
YEAR 1948

8. COST OF OPERATION: (Continued)

a. Comparative Mining Costs: (cont'd)

	1948 BUDGET	1948 COST PER TON	1947 COST PER TON
GENERAL MINE EXPENSE: (Continued)			
Special Expenses,	$ .005	$ .004	$ .006
Ishpeming Office,	.000	.003	.002
Mine Office,	.090	.059	.092
Insurance,	.012	.012	.013
Personal Injury,	.015	.009	.009
Social Security Taxes,	.023	.023	.026
Employees Vacation Pay,	.040	.022	.036
Hibbing Office,	.009	.015	.009
Total General Mine Expense,	.248	.200	.257
COST OF PRODUCTION,	$ 2.116	$ 1.780	$ 2.212

The cost of production for 1948 was $0.336 per ton under the budget and $0.432 per ton under the 1947 costs. The decrease in cost per ton in both instances was due to greatly expanded production and to a general increase in efficiency.

Under the caption "Underground Costs", there was a decrease in cost per ton from the budget figure of $0.272 and $0.321 from the 1947 costs. The decrease was spread throughout the various items with the exception of those under "Maintenance", which were up from both the budget and 1947 figures, as it was necessary to do considerable repair work as all the equipment was in very poor condition.

"Surface Costs" were $0.016 and $0.054 below the budget and 1947 costs, respectively. As in "Underground Costs", the decrease was in all items except "Maintenance" and again considerable repair work was necessary on the hoist, tram equipment, mine buildings, etc., causing these items to be higher than the budget and 1947 costs.

A decrease of $0.048 and $0.057 in "General Mine Expense" was realized from the budget and 1947 costs, respectively. The differences were normal and distributed throughout the items under this caption.

SARGENT MINE
ANNUAL REPORT
YEAR 1948

9. MAINTENANCE & REPAIRS:

A heavy program of repairs was carried forward throughout the entire year. It was necessary to suspend mining operations completely in November, and again in December, for a total of two weeks, for repairs to drift timbers, hoist and compressor. During the year, practically all large equipment was completely overhauled. Approximately 1,000 feet of 30-lb. main level rail was replaced with 45-lb. rail. Leaks and overflow pipe on the water tank were repaired and the tank was painted.

10. EXPLORATION AND FUTURE EXPLORATION:

There was no exploration work at this property during the year. It will be necessary, in the future, when drilling equipment is available, to further explore an isolated orebody on the north side of the property.

11. TAXES:

a. Statement of Taxes:

	1948	1947	Increase	Decrease
Sargent Mine,	$ 41,248.84	$ 41,227.99	$ 20.85	
Auxiliary Lands,	47.16	43.37	3.79	
Personal Property,	2,998.69	678.51	2,320.18	
Total,	$ 44,294.69	$ 41,949.87	$2,344.82	
Average Tax Rate,	161.02	171.48		10.46

The tax figures are not comparable as between 1947 and 1948, due to the fact that 5/6ths of the total 1947 taxes were paid by The Cleveland-Cliffs Iron Company and 1/6th by the International Harvester Company. The Harvester share is not included in the statement. There would be a decrease if the total 1947 figures were used.

The stockpiled ore was the property of International Harvester Company as of May 1, 1947. In 1948, Personal Property tax includes $2,079.60 for stockpiled ore and $919.09 for other personal property.

The reduced tax rate of 161.02 mills for 1948, as compared to 171.48 mills for 1947, is accounted for by the fact that the County rate is down 6.07 mills and also, an increased mineral valuation in connection with per capita limitation for levying taxes, has the effect of lowering the mill rate.

SARGENT MINE
ANNUAL REPORT
YEAR 1948

12. ACCIDENTS AND PERSONAL INJURY:

There were seven lost-time accidents at the Sargent Mine during 1948, and these are described as follows:

Joseph Stanich, injured March 15th. Stanich was closing the loading disc at skip station. Felt a pain in his left sid. Time lost, one week, four days.

Bob Madunich, injured April 12th. In breaking up ore chunks with hammer, one rolled against his right hand. Time lost, 5-1/2 days.

Toni Vuckovich, injured July 15th. Was putting up prop;dirt from side of slice came down and hit injured on left side and back. Time lost, one week, five days.

Jack Koski, injured August 11th. Koski was helping "Caterpillar" operator start machine. Koski was sitting on "tracs" and was switching machines over from gas to Diesel engine, when "Caterpillar" started in motion, catching his right leg and left ankle between "tracs" and hoist frame. Time lost - twelve weeks.

Andrew Hutari, injured August 26th. Injured was picking back, which is bottom of old main level switch. A piece of clay from between ties loosened and hit him on head. Impact rolled him down dirt pile with pick still in hand, which stuck in dirt and twisted his arm. Time lost, eight days.

Max Inkman, injured October 30th. Injured while lifting open set cap, felt numbness in right groin.

Wayne Hill, injured October 15th. Hill was standing by "tugger" while his partner was pulling ore. Cable whipped and hit injured party across both shins. Time lost: Two weeks, three days.

13. PROPOSED NEW CONSTRUCTION:

Depending on results of study now underway, it may be necessary to construct a small washing plant for the beneficiation of high silica ores.

14. EQUIPMENT PURCHASED AND PROPOSED NEW EQUIPMENT:

The following new equipment was purchased for the property during the year 1948:

SARGENT MINE
ANNUAL REPORT
YEAR 1948

14. EQUIPMENT PURCHASED AND PROPOSED NEW EQUIPMENT:

1 - Tractor, with Lull-Loading Equipment
1 - Differential 3-way Stockpile Car (used)
2 - RB-12 Jackhammers, with jackleg
2 - 22KW Woodborers
1 - 3 H. P. Blower
1 - 5 H. P. Blower
1 - 300 Amp. Welding Machine
2 - Sullivan 15 H.P. Tugger Hoists
1 - M.S.A. Electric Cap Lamp Installation (Lease)
1 - 100 K.W. Motor-Generator Set (used)

Proposed new Equipment

4 - 15 H.P. Double-Drum Tuggers.

WANLESS MINE
ANNUAL REPORT
YEAR 1948

1. GENERAL:

The drilling program, which was in progress on the Woodbridge property, under State Prospecting Permit No. 1145, was completed on January 13th, and State Lease No. 2054 was taken on the two Woodbridge forties, the E½ of the NE¼ of Section 16, 58-19, in June, adding the Woodbridge lease to the Wanless Mine.

In July, the Minnesota Power & Light Company completed an electric transmission line to the property. A substation was erected for power service, pumps were installed on a raft in the Wanless caves, pipelines erected and pumping operations started on August 12th and continued throughout the year.

Stripping operations, under contract with the Haley-Young Company, were started in September, using self-loading scrapers. After the receipt of the Marion shovel, in October, the Wanless loading and haulage equipment were used and 265,360 cubic yards were stripped up to December 31st.

4. ESTIMATE OF ORE RESERVES:

Factors:	Cu. Ft. Per Ton	Rock Deduction
Merch. Ore	14	10%

Lease:	RESERVE DEC. 31, 1948
Woodbridge:	
SE¼-NE¼ Sec. 16, 58-19	421,714 tons
Wanless:	
NE¼-NE¼ Sec. 16, 58-19	1,251,874 "
Grand Total	1,673,588 "

Estimated Analyses:

	Tons	Iron	Phos.	Sil.	Mn.	Al.
Woodbridge:						
Non-Bessemer Merch #1 ore	227,006	54.97	.090	6.92	1.28	2.17
Non-Bessemer Merch #2 Ore	194,708	47.09	.104	12.01	2.44	5.61
Total Woodbridge,	421,714	51.33	.096	9.27	1.82	3.76
Wanless:						
Non-Bessemer Merch #1 Ore	832,731	54.65	.136	7.48	1.60	3.79
Non-Bessemer Merch #2 Ore	419,143	48.96	.103	13.35	.89	9.09
Total Wanless,	1,251,874	52.75	.125	9.45	1.36	5.56
Total Non-Bess. #1 Ore,	1,059,737	54.72	.126	7.36	1.53	3.44
Total Non-Bess. #2 Ore,	613,851	48.37	.103	12.93	1.38	7.99
Grand Total,	1,673,588	52.39	.118	9.40	1.48	5.11

WANLESS MINE
ANNUAL REPORT
YEAR 1948

6. GENERAL SURFACE:

a. Buildings:

In the late fall, a small frame building was constructed for a mine warehouse and office, and a 40' x 60' steel building was purchased and erected for a truck service and repair shop.

b. Transmission Lines, Roads:

The necessary roads and transmission lines to serve the stripping operations, were constructed in late September and October.

7. OPEN PIT:

a. Stripping:

Stripping operations on the north side of the Wanless and in the south end of the Woodbridge leases, were started in September. The program called for the removal of 775,000 cubic yards of waste material, consisting of 492,000 yards of surface, 161,000 yards of waste ore material, 110,000 cubic yards of taconite and 12,000 cubic yards of gob, or a mixture of surface waste ore material and timber in the old underground workings. This would uncover approximately 100,000 tons of ore for the 1949 season. The cost was estimated at $219,590.00, or an average unit cost of $.283 per yard.

A contract for the stripping was let to the Haley-Young Mining Company, renting them the Wanless equipment and paying them $.280 per cubic yard for surface; $.320 per cubic yard for waste ore material and $.450 per cubic yard of taconite. During the balance of the year, from September to December, 265,630 cubic yards were stripped at a total cost of $70,081.33, or an average unit cost of $.272. This consisted of 188,867 cubic yards of surface, 36,022 cubic yards of waste ore material, and 40,741 cubic yards of taconite. With the exception of 47,777 cubic yards of surface which was taken from the Woodbridge lease, the stripping material was all taken from the Wanless.

In order to uncover 150,000 tons, which has been set up for the 1949 season, it will be necessary to add 160,000 cubic yards of stripping. This will consist of 110,000 cubic yards of taconite and 50,000 cubic yards of waste ore material. This will be over and above the 775,000 cubic yards already approved.

c. Pumping and Drainage:

Pumping, which was started in August, was continued throughout the year and the water in the Wanless caves was lowered approximately 28 feet and held at that elevation. In the early months of 1949, the water from the Woodbridge caves will be syphoned into the Wanless, after which the water in the Wanless will be lowered sufficiently to take care of the 1949 ore operations.

WANLESS MINE
ANNUAL REPORT
YEAR 1948

11. EXPLORATIONS:

Some additional drilling will be conducted on the south side of the Wanless in 1949, after the water in the caves has been lowered sufficiently.

12. TAXES:

The following is a statement of the taxes for the years 1948 and 1947 for the Wanless Mine:

	1948	1947	Increase	Decrease
Wanless Mine	$10,640.35	$ 3,798.48	$6,841.87	
Average Tax Rate,	78.99	91.13	12.14	

The large increase in 1948 taxes over those for 1947 is accounted for by the fact that the classification of ore in this property was changed from underground to open pit and thereby changing the rates from 7.35¢ and 2¢ per ton to 13¢ and 5¢ per ton.

The reduced tax rate of 78.99 mills for 1948, as compared to 91.13 mills for 1947, is accounted for by the fact that the County rate is down and also a generally increased mineral valuation in connection with per capita limitation for levying taxes, has the effect of lowering the mill rate.

13. FUTURE CONSTRUCTION:

A small crushing and screening plant, a railroad loading pocket and a short conveyor connecting the same with the screening plant, will be erected in the early summer of 1949 for the year's ore operations.

A power line from the Wanless to the Woodbridge shaft will be erected during the coming summer for pumping operations from the Woodbridge.

Safety Department

Annual Report

Year 1948

11. ACCIDENTS AND PERSONAL INJURY

a. Fatal Accidents

During the year of 1948 the company's injury rate was considerably improved over the previous year. There were three fatal injuries, all of which were preventable and supervisors were at least partly negligent. Our fatality rating per 1,000 employees for the year was 0.70 compared to 1.78 for 1947 and 0.86 for the five-year period 1941 to 1945.

Following is a brief summary of fatal injuries during 1948:

Willis J. Laforrest, Mather Mine, "A" Shaft

At approximately 9:15 A.M., Wednesday, January 14th, Mr. Willis J. Laforrest, age 23, of the Furnace Location, Negaunee, Michigan, employed as a motorman at the Mather "A" Mine was fatally injured in an accident on the 3rd Level Plat of the mine.

Haulage on the 3rd Level is by use of 6-ton battery locomotives; cars are of the Granby-type, side dump, 6-ton capacity and total weight of approximately 8 tons when loaded. Track gauge is 30 inches and rails are 60 pounds. The locomotives usually haul six (6) cars per trip and are dumped by use of a 5th wheel which is attached to the side of the car and protrudes approximately twenty-two (22) inches outside the rail. Tracks at the shaft station are in very good condition and there is a guard rail along the track farthest from the trench to prevent cars from twisting when the 5th wheel is rolling over the camel-back. Angle iron attached to the car slips under one edge of the camel-back to prevent the cars from turning over into the trench while dumping.

During the normal working operations on the 3rd Level there has not been any need to move the camel-back away from the rails. But, it has been moved to the North and South in order to dump material to any particular place in the trench. On the day previous to the accident a rock-drifting crew on the 3rd Level had cleaned up some mud in a drift and dumped it into the trench. The camel-back was moved to the North end of the trench and the mud dumped into the trench in this position.

A crew of men working on the 6½ Level hoisted their rock to the 3rd Level on the cage in a 2-ton rocker-type car. On the night shift this crew had loaded this rocker-type car with rock and hoisted it to the 3rd Level to be dumped into the trench. This rock had to be dumped into the North end of the trench to avoid contamination of the ore. For this reason, the camel-back would either have to be moved to the South end of the trench or away from the trench by use of a ratchet-gear to allow the rocker dump car to pass. They chose this latter method and by use of the ratchet-gear moved the camel-back 4½ inches away from its regular dumping position. The reason it was not moved farther away was because of debris. Although, it could have been moved as much as twelve inches.

The camel-back was left in this position at the end of the shift. When the day shift haulage crew came on shift for the day-shift on January 14th they loaded two cars of wet ore in #3 chute.

(Continued)

Safety Department

Annual Report

Year 1948

11. ACCIDENTS AND PERSONAL INJURY

a. Fatal Accidents (Continued)

During the loading of the second car the crew lost control of the chute and the wet dirt ran onto the tracks. The rest of the cars were pulled through the wet ore and taken to shaft. As the train approached the air-doors at the shaft plat they saw the red signal light which indicated that the camel-back had to be moved. The brakeman opened the air-doors, uncoupled the locomotive, and Laforrest, who was the motorman, brought the locomotive to the camel-back which was then pulled to dumping position at the South end of the trench. Laforrest then backed his locomotive to the cars where the automatic couplings closed, and he then started forward with the train to dump the cars. Investigation showed that the fifth wheel, or dumping wheel, of the first car struck the hold-down bracket of the camel-back, bending the hold-down bracket downwards, causing the dumping wheel to climb and at the same time lift the entire car from the rails. The shift of the car was into the trench and with its heavy load it dragged the locomotive into the trench with it. Laforrest, who was standing in the operating position in the motor-pit, was not expecting such a heavy blow and was first thrown forward and then pitched into the trench where the wooden board cover of the locomotive batteries struck him high on the left chest, crushing that part of his chest, splintering ribs, punctured the lungs and large blood vessels.

Because of the fact that the 3rd Level camel-back had never been moved away from the trench to allow cars to pass, the day shift crew did not notice anything unusual about the position of the camel-back. The boss in charge of the crew of men working on the 6½ Level who had moved the camel-back, had taken it for granted that the day shift crew would move the camel-back into the proper dumping position.

Responsibility, it seems, must be placed on those involved (all) in the accident. Since this accident a number of new methods have been discussed to prevent a re-occurance.

Rudolph Saari, Mather Mine, "B" Shaft

Rudolph Saari, shaft miner, Mather Mine, "B" Shaft, was instantly killed at approximately 2:30 A.M. on February 6, 1948 when he was struck by a sledge hammer which fell from surface to the bottom of the shaft, a distance of 460'.

When the midnight shift came on duty on February 6th the men put in corrugated steel, lowered the guides, and lowered the utility hoist which is used to hoist the mucking tray. When most of this work was completed, part of the crew stayed at the bottom of the shaft and the rest went to surface to take down the mucking tray and straighten the dumping bar on the cage. While part of the crew was loading the mucking tray onto the cage the shift boss and one other man started straightening the dumping bar by striking it with sledge

(Continued)

Safety Department

Annual Report

Year 1948

11. ACCIDENTS AND PERSONAL INJURY

a. Fatal Accidents (Continued)

hammers. One of the men struck the bar a glancing blow which twisted the hammer from his hands and plunged it into the shaft, passing between the shaft collar and the floor of the cage. This space was only 6 inches wide and 3 feet long. The sledge hammer struck Saari on the back of the head where he had been standing on the muck pile at the bottom of the shaft, causing instant death.

This accident involves poor judgement on the part of the shift boss and also men at the bottom of the shaft who had strayed away from their overhead guard planks. There was a failure to coordinate work being done .

New recommendations to prevent a similar accident hardly seem necessary for our rules and safe-practices cover every operation in shaft work.

Leonard Hellier, Cambria-Jackson Mine

At approximately 1:30 A.M. on December 10, 1948 Leonard Hellier, age 30, miner, Cambria-Jackson Mine, received what first appeared to be a minor bruise to the back of his left knee. He was taken to the Twin City Hospital where Dr. R. A. Burke treated him for contusion of the left knee and abrasions on the side of the face and nose. Mr. Hellier did not respond to treatment because of a poor blood condition and varicose veins. Gangerene set in and amputation was necessary. He died from shock and other complications on December 22, 1948.

Because of the fact that the injury seemed of a minor nature, only the foreman's report was made out on the accident; but, because it was the second accident in the contract within a few days, the superintendent and mining captain did make an inspection of the place on the same day of the second accident.

The accident occurred in Number 6 Contract which is located on 370' sub-level, 5th Level. The drift this contract was driving was to the south-east of their raise and originally was a small (4' x 6') exploratory "dog" drift with no timbering. After it had been advanced 47 feet, the ground started to slough off so it was decided that it must be timbered. This work was started at the raise and the drift timbered with 8-foot timber. The seams were pitching from north to south and the ore was of the slate-type which made the ground very treacherous and required every precaution.

When Hellier and his partner, James Luca, went off shift the morning of December 9th they had completed drilling the blast holes for stripping on the right side and back of the drift. The next shift, which starts at 4:00 P.M. and finishes at 12:00 Midnight, charged these blast holes, fired them, put in two "H" beams as forepoles, placed 3½-foot lagging across the "H" beams as protective head cover and scraped out the ore. This was 35 feet from the raise

(Continued)

Safety Department

Annual Report

Year 1948

11. ACCIDENTS AND PERSONAL INJURY

a. Fatal Accidents (Continued)

and 12 feet from the old breast of the heading.

Hellier and Luca returned to the contract just after midnight on December 10th and decided that they would have to dig hitches for their timber legs, but did nothing about more support for the back or sides. The shift boss visited the contract about 12:30 A.M. Between 1:15 and 1:30 P.M., Hellier was shoveling ore from the timber hitch when a chunk of ore about 18" by 18" by 8" fell from the back of the drift and struck Hellier a glancing blow on the hip. Hellier fell as another smaller piece of ore struck him on the back of the left knee and another small piece struck the side of his face. Luca pulled Hellier to a safe place under the timber, got help and Hellier was taken to surface where a doctor examined him and then was taken to the hospital.

In my estimation, responsibility for this accident should be placed on all four men on both shifts and also on the shift-bosses. The company rules state that: "Fore-poles re-inforced with two or more "H" beams, minimum size - 4 inches, 10 pounds to the foot, shall be used between the last set of timber and the heading when there is ore or rock in the back" and "Not less than two sound poles shall be used to support the sides of an advancing ore drift or slice." In this case, only two "H" beams had been used and only half-length lagging used over them so the back was exposed approximately $2\frac{1}{4}$ feet on each side and there was no support for the sides of the drift. Both shift bosses had visited the contract after the "H" beams and short lagging had been installed but had not given orders to eliminate the hazard. Both shifts of miners in the contract knew the rules but did not follow them.