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2. PRODUCTION, SHIPMENTS & INVENTORIES:

a. Production:

Agnew, ---------- 198,519 tons

b. Shipments:

Agnew, ---------- 142,796 "

c. Stockpile Inventories:

Agnew, ---------- 55,723 "

d. Production by Months:

Month:	Tons
March,	7,608
April,	18,077
May,	19,879
June,	19,897
July,	23,920
August,	23,912
September,	19,759
October,	25,256
November,	19,805
December,	20,406
Total,	198,518

f. Ore Statement:

Shaft production onto the stockpile continued after the close of the shipping season, bringing the production for the year to 198,519 tons.

g. Delays:

September 9th, - 8 hours - Electrical storm
September 10th, - 16 hours - Repairing storm damage
September 20th, - 16 hours - Shaft repair
September 22nd, - 16 hours - Shaft repair
September 23rd, - 16 hours - Shaft repair

3. ANALYSIS:

a. Production:

	Tons	Iron	Phos.	Silica	Mang.	Alu.	Moist.	Fe. Nat.
Agnew,	198,519	58.32	.050	7.77	.78	1.53	12.06	51.29

b. Shipments:

Agnew,	142,796	58.23	.050	7.80	.77	1.54	12.56	50.92

c. Mine Analysis of Ore in Stockpile:

	55,723	58.54	.050	7.66	.79	1.49	10.79	52.22

d. Complete Analysis of Shipments:

Iron	Phos.	Silica	Mang.	Alum.	Lime	Mag.	Sul.	Loss
58.23	.050	7.80	.77	1.54	.35	.20	.011	5.62

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4. ESTIMATE OF ORE RESERVES:

a. Factors Used:

	Cu. Ft. Per Ton Crude	% Recovery
Merch. Ore,	14	100.0

b. Ore Reserves:

	RESERVES 1-1-47	MINED 1947	RESERVES 1-1-48
NE¼-NE¼ 11,57-21	1,888,270	198,519	1,689,751

c. Analysis of Ore Reserves:

Tons	Iron	Phos.	Silica	Mang.	Alu.	Moist.	Fe. Nat.
1,689,751	58.13	.053	8.21	.75	1.42	14.50	49.70

5. LABOR & WAGES:

a. Comments:

There was a shortage of experienced miners throughout the year. During the strike, all the Agnew miners were working at other mines, but after much urging, practically all returned. Training of student miners produced a few good men, but it continues difficult to get young men to go underground when open pit work is available. There was a general wage increase of 12-1/2 cents per hour, effective April 1st.

b. Comparative Statement of Wages and Product:

PRODUCT:	198,519 tons
No. Shifts,	486
AVG. NO. OF MEN WORKING:	
Surface,	14-3/4
Underground,	61-1/2
Total,	76-1/4
AVG. WAGES PER DAY:	
Surface,	10.488
Underground,	12.360
Total,	12.000
PRODUCT PER MAN PER DAY:	
Surface,	36.213
Underground,	12.965
Total,	9.547
LABOR COST PER TON:	
Surface,	.309
Underground,	.936
Total,	1.245

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5. LABOR & WAGES:
(Continued)

b. Statement of Wages & Product: (Cont'd.)

TOTAL NO. OF DAYS:	
Surface,	256
Underground,	256
Total,	256
AMOUNT FOR LABOR:	
Surface,	$ 38,914.40
Underground,	189,309.43
Total,	$228,223.83

The mine was operated:
6 days per week, single shift, March 1st to March 12th.
6 days per week, double shift, March 12th to Dec. 31st.

6. SURFACE:

a. Buildings, Repairs:

No extensive repairs were made during the year. The office was enlarged to one room by taking out the center hall partitions.

b. Stockpile:

The Harvester stockpile of 64,576 tons was loaded in April and the grounds carefully cleaned up in August. Frost conditions were very bad, but loading of this high pile was safely and efficiently done with a 120-B, 5-yard shovel, rented from Butler Brothers.

A total of 55,723 tons was in stockpile as of December 31,1947.

The stockpile grounds were enlarged by absorbing half of the timber yard to the west and a new, and larger, timber yard prepared, east of the shaft main tracks. A new railroad spur and road serve for either rail or truck deliveries.

c. Tracks, Roads, Pipelines, etc:

Twenty-three hundred feet of 18 inch pipe line across the South Agnew was taken up. Butler Brothers layed a new 20 inch line outside the stripping area and we connected to it with 700 feet of new 16 inch line.

During the storm of September 9th, sand washed over the retaining wall, back of the mine buildings, and into the transformer station. In cleaning up, a small shovel took a cut behind the wall protecting the area from future storms. Lightning struck the control shed for the Layne-Bowler pump; the shed was destroyed completely and the controls damaged.

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7. UNDERGROUND:

a. Shaft Sinking:
None

b. Development:
No extensive development was necessary; one drift south on the 4th sub, two ore raises from the main level and a few drifts to open blocks of ore for slicing.

c. Stoping:
The mining method is regular top slicing. Sub-level interval is 14 feet and normal post length is 12 feet, but varies from 12 feet to 5 feet. Fifteen horse-power slusher hoists are used in slices and short pulls to main level raises. Only one contract had hand-tramming and with the delivery of new 20 h.p. slusher hoists, which are more efficient on a long pull, hand-trams and building of slides were eliminated.

d. Timber:
Acquiring satisfactory mining timber on March 1st presented quite a problem, because highways are closed to heavy loads from March 20th to June 1st. All the jackpine that local dealers could furnish was immediately purchased. The timber in the Harvester inventory had been cut one year or more, but it was necessary to use it. After June 1st, new jackpine timber was available and tamarack in the late fall.

Statement of Timber Used:	Lineal Feet	Amount 1947
7" to 9" Jackpine post timber,	167,655	$ 15,927.23
9" to 11" Jackpine cap timber,	47,342	7,811.43
Total Slicing Timber,	214,997	$ 23,738.66
7" to 9" Tamarack sub-level timber	22,939	$ 2,297.58
9" to 11" Tamarack main-level timber	1,619	291.42
5" Tamarack poles,	(pcs.) 20,934	9,316.50
3" Tamarack poles,	" 27,550	8,953.75
5/8" Mining Boards (M) - Bd. Ft.	233,500	9,340.00
Mine fencing wire (rolls)	290	4,297.80
6' Lagging (Cords) -	81-3/4	1,438.80

Product, ----------	198,519
Ft. Slicing timber per ton of ore ----------	1,083
Cost per ton for timber, lagging, --------	
Poles, boards and wire, ----------	.301

e. Mining & Loading:
The 15 H.P. slusher hoists which had been left in the mine during the strike and run occasionally, developed electrical trouble. Delivery of repair parts and new hoists was slow. Old 7 H.P. hoists and three second-hand 15 H.P. hoists were used until delivery of new

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7. UNDERGROUND: (Continued)

e. Mining & Loading: (Continued)

20 H.P. hoists late in the summer. Jackhammer machines were all old and new ones purchased monthly.

f. Ventilation:

Natural ventilation through the main shaft, and an air raise to the open pit is not quite sufficient, so that one large fan is operated near the air raise and small fans, up to 5 H.P. are used throughout the mine.

8. COST OF OPERATION:

a. Comparative Mining Costs:

	BUDGET ESTIMATE	COST 1947 MAR. 1ST-DEC. 31ST.
PRODUCT:	200,000	198,519
Average Daily Product,		775.46
Tons Per Man Per Day,		9.547
Days Operation,		256
COST:		
Total Cost at Mine:		
Underground Costs,	$1.635	$1.698
Surface Costs,	.154	.188
General Mine Expense,	.219	.229
Cost of Production,	$2.008	$2.115
Loading & Shipping:		
Power Shovel,		.002
Pocket,	.027	.016
Total Loading & Shipping,	.027	.018
Purchase of Plant and Equipment		.095
Taxes - Ad Valorem		.098
Taxes - Occupational		.015
Taxes - Royalty		.020
Administrative Expense		.054
Miscellaneous Income & Expense		
GRAND TOTAL		$2.415

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8. COST OF OPERATION: (Continued)

a. Comparative Mining Costs: (Continued)

Electrical repair to old slusher hoists and many new scrapers, raised this cost over the budget. Pumping machinery was high, due to new pipe line and storm damage.

Surface costs were over the budget by the amount spent repairing storm damage and extra shaft repair.

General Mine Expenses were about as estimated.

10. TAXES:

a. Statement of Taxes:

Agnew Mine, ----------	$ 19,153.01
Personal Property, ----------	366.02
Total Taxes, ----------	$ 19,519.03

11. ACCIDENTS AND PERSONAL INJURY:

There were three lost-time accidents at the Agnew Mine during the year. These are described as follows:

Name: John Luoma Date: May 25th.
Cause: Luoma, with help of his partner, the captain and shift boss, had put up a set of timber, after which the captain and shift boss, completing an inspection, left the working place. Luoma then placed a short sprag (2 ft.) from the cave side post to the cave, to prevent the set from slipping forward. He was standing on the staging, with his left foot against the breast, and had placed the sprag in position to nail, when the spot where his foot was resting against the breast, sloughed away and knocked him down. In falling, his right hand apparently struck the stage hook on the post, tearing the palm of his hand quite severely.
Nature of Injury: Curved cut on palm of right hand, adjacent to fourth and fifth meracarphalangeal joints.
Time Lost: 2 Weeks - 1 Day.
Compensation Paid: $ 28.00.

Name: Anthony Angelo Date: July 30th.
Cause: Angelo was splitting a block of wood, when his axe handle touched the timber that the block was on and the axe was thrown out of control, so that he cut his left thumb.
Nature: Cut, 1-1/4" long across dorsum of thumb over proximal joint.
Time Lost: 2 Weeks - 4 Days.
Compensation: $ 45.00.

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11. ACCIDENTS AND PERSONAL INJURY: (Continued)

Name:	Paul Lulich Date: August 2nd.
Cause:	He was trimming loose dirt from the back, when a large chunk fell from the set and hit Lulich on the left shoulder and hip.
Nature:	Fracture acromial process left scapula; no displacement. Large swelling over lower back over the sacum, with marked ecchymosis, swelling about $2\frac{1}{2}$" in diameter, quite thick.
Time Lost:	Eleven weeks.
Compensation:	$230.57.

13. EQUIPMENT AND PROPOSED EQUIPMENT:

New equipment received during 1947 consisted of eight Ingersoll-Rand RB-12 Jackhammers, one 5 H.P. and one 3 H.P. Fab and four Sullivan 20 H.P. slusher hoists. Second-hand equipment consisted of three 15 H.P. slusher hoists and one 5 H.P. fan.

Increasing the number and horse-power of slusher hoists has overloaded the rotary converter set, slowing down slushing, fans, and main level tramming, all operating on D.C. current. It is planned to double capacity by installing an additional set.

16. PUMPING:

Mine drainage is handled by four centrifugal pumps on the main level at 612 elevation; 338 foothead to surface. These pumps have capacities of 700, 1600, 1600, and 2250 gallons per minute; normal flow during the strike was 1800 gallons per minute. A 1500-gallon Layne & Bowler pump in the South Agnew shaft was started March 6th, when the water elevation stood at 755. Operating this pump 12 to 16 hours per day holds the water at 700 elevation, below the south line contracts, and reduces the flow to the underground pumps from 1800 to 800 gallons per minute.

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1. GENERAL:

A regular cycle of operations were carried forward at this property during the year. Stripping on both the Wade and Merritt leases was continued from 1946 on a 20-shift per week basis until February 15th, at which time the schedule was reduced to ten shifts per week, the operation being a combination of stripping and ore cleanup until ore shipping started on April 11,1947. Operations advanced on a 10-shift basis until June 14th, 1947, when an 18-shift week was started and continued until the end of the ore season. During the ore season, operations consisted of loading ore when shipments could be handled, in mining and stocking aluminiferous ore in surface stripping and cleaning up lean ore and waste material. The conveyor system was put into operation the third week of August, eliminating the long haul from the pit bottom to the loading ramp on surface. Upon completion of the ore season, surface material was stripped on a 2-shift basis for the balance of the year.

Sample drilling with the Parmanco drill was attempted during the spring, but was unsatisfactory and was abandoned.

Equipment was repaired as need arose throughout the year.

The work of construction of the conveyor system on E&A No. 1 was carried forward as material was obtained and when completed during the latter part of August, the system was put into operation.

2. PRODUCTION, SHIPMENTS & INVENTORIES:

a. Production by Grades:

Atkins Merritt,	27,018	tons
Atkins Extension Lease,	405,687	"
Total,	432,705	"

b. Shipments:

Atkins-Merritt,	27,018	"
Atkins Extension Lease,	363,796	"
Total,	390,814	"

c. Stockpile Inventory:

Atkins Merritt,	-	
Atkins Extension Lease,	41,890	"

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2. PRODUCTION, SHIPMENTS & INVENTORIES: (Continued)

d. Production by Months:

MONTH	ATKINS EXTEN. LEASE	ATKINS-MERRITT	TOTAL
April,	5,374	4,987	10,361
May,	45,694	4,378	50,072
June,	57,370	855	58,225
July,	45,464	-	45,464
August,	60,369	1,484	61,853
September,	56,396	1,967	58,363
October,	104,328	13,347	117,675
November,	30,692	-	30,692
Total,	405,687	27,018	432,705

g. Delays:

There were numerous delays throughout the first part of the ore season in shifting the rented shovel back and forth between the mining and stripping operations previous to the delivery of the new 54-B shovel in July. And long delays were occasioned by impossible haulage conditions in the pit during wet weather.

3. ANALYSIS:

a. Production:

	Tons	Iron	Phos.	Sil.	Mang.	Alu.	Moist.	Fe.Nat.
Atkins Merritt,	27,018	48.12	.138	12.08	1.29	8.50	20.59	38.21
" Ext. Lease,	405,687	48.21	.137	12.61	1.67	7.16	16.98	40.02
Total,	432,705	48.21	.137	12.58	1.65	7.24	17.21	39.91

b. Shipments:

Atkins Merritt,	27,018	48.12	.138	12.08	1.29	8.50	20.59	38.21
" Ext.Lease,	363,796	48.43	.137	12.51	1.67	7.16	17.98	39.72
Total,	390,814	48.41	.137	12.48	1.64	7.25	18.16	39.62

c. Mine Analysis of Stockpile Ore:

	41,890	46.29	-	13.52	-	8.32	-	-

d. Complete Analysis of Shipments:

	Iron	Phos.	Sil.	Mang.	Alu.	Lime	Mag.	Sul.	Loss
Atkins Merritt,	48.12	.138	12.08	1.29	8.50	.35	.20	.011	7.89
" Ext.Lease,	48.43	.137	12.51	1.67	7.16	.34	.19	.011	7.83

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4. ESTIMATE OF ORE RESERVES:

a. Developed Ore:

	RESERVE 1-1-47	MINED 1947	BALANCE AFTER MINING	CHANGED BY ESTIMATES	RESERVE 1-1-48
Merritt:					
SE-NW 12-58-19	67,666	27,018	40,648	31,191	71,839
Wade:					
NE-SW 12-58-19	1,210,931	405,687	805,244	13,983	819,227
Wade:					
NW-SE 12-58-19	265,474	-	265,474	180,584	446,058
Total Wade,	1,476,405	405,687	1,070,718	194,567	1,265,285
Grand Total,	1,544,071	432,705	1,111,366	225,758	1,337,124

b. Prospective Ore:

It is not expected that there will be any appreciable change in the reserve tonnage for this property.

c. Estimated Analysis:

	Tons	Iron	Phos.	Sil.	Mang.	Alu.	Moist.
Merritt-SE-NW 12-58-19 #1	50,628	57.19	.093	7.50	1.10	2.23	15.00
Merritt SE-NW 12-58-19 #2	21,211	47.78	.146	11.10	2.08	7.17	18.00
Total Merritt,	71,839	54.41	.109	8.56	1.39	3.69	15.89
Wade NE-SW 12-58-19 #1	590,715	57.19	.093	7.50	1.10	2.23	15.00
Wade NE-SW 12-58-19 #2	228,512	47.78	.146	11.10	2.08	7.17	18.00
Wade NW-SE 12-58-19 #1	233,029	57.19	.093	7.50	1.10	2.23	15.00
Wade NW-SE 12-58-19 #2	213,029	47.78	.146	11.10	2.08	7.17	18.00
Total Wade #1,	823,744	57.19	.093	7.50	1.10	2.23	15.00
Total Wade #2,	441,541	47.78	.146	11.10	2.08	7.17	18.00
Total Wade,	1,265,285	53.91	.111	8.76	1.44	3.95	16.05
Total No. 1,	874,372	57.19	.093	7.50	1.10	2.23	15.00
Total No. 2,	462,752	47.78	.146	11.10	2.08	7.17	18.00
GRAND TOTAL,	1,337,124	53.93	.111	8.75	1.44	3.94	16.04

5. LABOR & WAGES:

a. Comments:

The supply of labor was satisfactory throughout the year, and operations were conducted smoothly under the present labor contract.

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5. LABOR & WAGES: (Continued)

b. Comparative Statement of Wages and Product:

PRODUCTION

Direct Ore, ----------	432,705 tons.
Number of Days Operated, ----------	126
Average Number of Men Working, ----------	62
Average Wages Per Day, ----------	$ 11.62
Product Per Man Per Day, ----------	71.22
Labor Cost Per Ton, ----------	.164
Total Number of Days, ----------	6,075
Amount Paid for Labor, ----------	$71,174.64

6. SURFACE:

a. Buildings, Repairs:

The concrete block repair shop was completed in January and a small extension added during the summer.

b. Tracks, Roads, Transmission Lines, etc:

The main entrance from highwas extended around the stripping area at the East end of the pit.

The transmission lines on the South side of the pit were re-arranged to allow for dump site to the South.

7. OPEN PIT:

a. Stripping:

Stripping operations under E&A No. 3, which entailed the removal of 460,000 cubic yards of surface and 40,000 cubic yards of rock to uncover ore for the 1947 season, was carried forward from 1946 on a 20 shift per week basis, with a swing crew. This program was completed on March 15th, after a total of 499,777 cubic yards were moved, with a shift average of 1,190 cubic yards, and the cost ran slightly above the estimated thirty-two cents per cubic yard.

The new program, under E&A No. 4, was started on March 15th, to strip 459,000 cubic yards of surface and 30,000 cubic yards of rock from the Wade lease, to release ore in the East end of the property. This operation was carried on to June 14th, on a 10-shift per week basis and then on an 18-shift schedule intermittently with ore, until the end of the ore season on November 20th, at which time stripping was put on a 20-shift basis with swing crew, until the end of the year.

The cost per yard to the end of the year, under E&A No. 4, was $.350 compared to the estimated cost of $.290. A shift average of 1,247 cubic yards was maintained.

Operations were hampered throughout the entire program, due to the necessity of using old rental shovels the early part of the year

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7. OPEN PIT
(Continued)

a. Stripping: (Continued)
while waiting for the delivery of new machine. During the ore season, stripping was carried forward intermittently with ore operations, which entailed considerable moving of the equipment, as only one shovel was available for both jobs a greater part of the time. Due to the painty quality of the ore in this property, haulage conditions are practically impossible during wet weather, which caused slow operations and, at times, complete shutdowns. All material from the stripping program was deposited on approved dumps to the South of the pit.

The following tabulation shows the classes and quantities stripped from the leases, during the year:

	Surface Cu. Yds.	Rock Cu. Yds.	Total Cu. Yds.
Wade Lease,	430,620	19,418	450,038

g. Open Pit Mining and Loading:
Mining for the season of 1947 was started on April 11th, with intermittent loading of ore which had been stockpiled in the pit during the spring cleanup, and from the newly-stripped area in the pit. Out of a total production of 432,705 tons, 27,018 tons were mined from the Merritt property and 405,687 from the Wade lease. This consisted of 61,628 tons of No. 1 or high grade ore and 371,077 tons of No. 2, or aluminiferous ore.

All operations were confined to the pit bottom with shallow cuts averaging 6 feet - 8 feet deep. This was necessary in order to obtain proper split between the No. 1 and No. 2 ores. Ore was not produced on a definite schedule, but only shipments could be handled, and, as haulage conditions permitted the trucking of the ore. Production was low during the early part of the season, with only one shovel available, which caused excessive moving from ore to stripping and cleanup. During the latter part of the season, after delivery of the new 54-B shovel, better progress was made and the production was further improved after the conveyor system went into operation. Ore loading was concluded on November 25, 1947.

Stockpile areas were prepared near the loading pocket on surface and aluminiferous ore stocked there when necessary for orderly operation. The stocking ground for lean aluminiferous ore was prepared on the north side of NW-SE Section 12 and this material was stocked as it was encountered in mining.

k. Drainage:
The pumping setup was revamped on April 1st, when the discharge pipe line was moved from the south bank of the pit to the north bank, due to the fact that it was necessary to relocate the off-take ditch leading from the mine, southward.

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8. COST OF OPERATION:

a. Comparative Mining Costs:

	1947 BUDGET	1947 COST PER TON	1946 COST PER TON
PRODUCT			
Direct Ore, (tons)	400,000	432,705	-
Number of Days Operated,		126	-
Average Shift Production,		2,090	-
Tons Per Man Per Day,		71.22	-
Pit Operating:			
Drilling and Blasting,	$.030	-	-
Power Shovels Operating,	.035	$.039	
Power Shovels Maintenance,	.020	.010	
Trucks Operating,	.040	.065	
Trucks Maintenance,	.034	.032	
Pit Roads and Ramps,	.020	.023	
Conveyors Operating,	.030	.032	
Total Direct Ore,	.209	.201	
General Pit Expense:			
Pumping and Drainage,	.020	.034	
Watchmen,	-	.001	
Pit Cleanup,	.040	.037	
General Open Pit Expense,	.011	.025	
Open Pit Superintendent,	.010	.007	
Stocking Lean Material,	.030	.002	
Waste Pile Expense,	.006	-	
Exploratory Drilling,	.015	.008	
Total General Pit Expense,	.132	.114	
Stocking and Loading Ore,	-	.030	
General Mine Expense:			
Mining Engineering,	.007	.007	
Mechanical & Electrical Engr.	.003	.005	
Analysis and Grading,	.045	.030	
Safety Department,	.003	.003	
Ishpeming Office Expense,	.003	.002	
District Office Expense,	.011	.009	
Mine Office Expense,	.011	.013	
Insurance, Property, etc.	.001	.004	
Personal Injury Expense,	.003	.004	
Social Security Taxes,	.005	.021	
Geological,	-	.001	
Employees Vacation Pay,	.004	.006	
Total General Mine Expense,	.096	.105	
Winter and Idle Expense,	.100	-	
COST OF PRODUCTION,	$.537	$.450	

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8. COST OF OPERATION: (Continued)

a. Comparative Mining Cost: (Cont'd)

The 1947 cost was $.450 per ton compared with the estimated cost of $.537.

The total "Direct Ore" costs were $.008 lower than the budget. "Drilling and Blasting" was lower by $.030 as it was found that no drilling or blasting was necessary during the season. Under the caption "Power Shovel Operating", the costs were $.004 higher and "Power Shovel Maintenance" was $.010 lower than the estimated costs. "Trucks Operating" was $.025 higher, due to the fact that the conveyor system was not in operation until the latter part of August, necessitating a long haul out of the pit to the loading ramp on surface, and to heavy tire costs caused by severe haulage conditions. There were only nominal differences of $.002, $.003, and $.002 under the captions "Trucks Maintenance", "Pit Roads and Ramp", and "Conveyors Operating", respectively.

General Pit Expense was $.018 lower than the budget. Only nominal differences occur under the captions "Watchmen", "Pit Cleanup", and "Open Pit Superintendent". "Pumping and Drainage" was $.014 higher, due to extensive changes in the pumping setup. Construction of stacker conveyor and addition to the garage were absorbed in operating costs under the caption "General Open Pit Expense", making this item $.014 higher than the budget. A larger tonnage produced than was expected account for "Open Pit Superintendent" being $.003 lower than the budget. "Stocking Lean Materials" was below the budget by $.028, due to the fact that not as large a tonnage of lean material was encountered as was expected. There was no "Waste Pile Expense", therefore, a saving of $.006 from the budget. "Exploratory Drilling" was curtailed, making this item $.007 lower than the budget.

Under the heading "General Mine Expense", the total cost was $.009 higher than the budget. Only nominal differences occurred under the items "Mining Engineering", "Safety Department", "District Office Expense", "Mine Office Expense", and "Geological". "Analysis and Grading" was $.016 lower, due to being spread over a large tonnage than anticipated. "Social Security Taxes" were $.016 higher than expected.

The cost of $.100 set up for "Idle and Winter Expense" was not used.

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9. EXPLORATIONS AND FUTURE EXPLORATIONS:

During February and March, considerable drilling of test holes for further information on the ore body, was carried forward with an auger drill, but the results were rather questionable and work was discontinued. During the summer, holes were drilled with a blast drill and sampled with good results. A program of this type of drilling will be put into effect at the end of stripping in January, for the 1948 season. In addition, in 1948, two holes will be drilled by the Leach Exploration Company to check a possible extension of the ore body at the east end of the pit.

10. TAXES:

The following is a statement of taxes at the Atkins Mine for the years 1946 and 1947:

	1947	1946
Atkins Mine, ...	$ 18,620.60	$ 338.59
Personal Property, ...	2,288.29	12.55
Total, ...	$ 20,908.89	$ 351.14

The mine was not on an operating basis until 1947.

11. ACCIDENTS AND PERSONAL INJURY:

There was one lost-time accident at the Atkins Mine during the year 1947, which is described as follows:

Name: Donald Fowler Date: November 21st.
Nature: Fowler was engaged as a truck driver, and while performing such duties, operating a truck, one of the front wheels of truck sank into the dump, spinning the steering wheel and Fowler received an injury to the thumb of his right hand.
Time Lost: 5 Weeks, 2 Days.
Compensation: $ 144.00.

12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION:

Construction of the conveyor system was continued from 1947 and, although delayed by the non-delivery of material, was put into operation the third week of August. In addition, a stacker was constructed in order to stock aluminiferous ore near the loading pocket.

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION: (Continued)

Construction at the truck garage was completed in January and a small extension constructed during the summer. Two 5,000-gallon Diesel fuel tanks were received and installed near the garage to facilitate handling of bulk fuel.

13. EQUIPMENT AND PROPOSED EQUIPMENT:

A 54-B shovel, with dragline boom and attachments, and a 15-ton Euclid truck were purchased for this property during the year.

14. MAINTENANCE AND REPAIR:

Repairs to equipment were carried on as the need arose during the year.

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1. GENERAL:

Pit operations were continuous throughout the year. Maximum ore production and extensive development work made it necessary to conduct the operations on a 6-day per week basis during the ore season and on a 40-hour, 20-shift per week basis through the use of a swing crew during the balance of the year. In the latter plan, most men worked 40 hours per week, although the operations were conducted on seven days.

In addition to the usual maintenance, major repairs and general overhauling of the pit equipment were made when the units could be spared from service. The latter was necessarily not too thorough and the equipment is now showing the strain of the war years.

Washing plant repairs were conducted from the first of the year until the beginning of the ore season and were again resumed at the close of the mining season.

The stripping program in the South Bovey area, which was underway at the first of the year, was completed in February. Operations were then shifted to the north side of the Mid-Snyder forty for the months of March and April. Some stripping and lean ore was removed throughout the ore season, or on the third, or night shift, and at times concurrently with the mining on the day and afternoon shifts when equipment was available for this work. After the close of the ore season, surface stripping was again resumed in the South Bovey, extending the pit limits southward. In addition, some lean ore, waste ore material and paintrock was stripped from the bottom of the pit in the South Bovey, the East Snyder and the Hemmens leases.

Mining operations were started on May 5th and continued through October 25th. Throughout the greater part of the season, the operations were conducted on a 2-shift per day, 6-day per week basis, using the third, or night shift, for moving waste and lean ore and for shifting equipment. Ore was mined in the South Bovey; the East Snyder and the Mid-Snyder and West Bovey forties.

The washing plant operated on the same schedule as the pit and the operations throughout the season were very satisfactory. A uniformly high output of crude ore from the pit at all times resulted in an average shift production of 2,947 tons of concentrates. This compares with 2,339 tons in 1946 and is an all-time high for any season at the Canisteo. The high output was secured despite a low weight recovery and delays inherent to stocking concentrates. However, this was accomplished at the expense of the proposed stripping program which was to have been conducted concurrently with the mining, for peak ore production left little equipment available for stripping.

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1. GENERAL:
(continued)

Pumping was carried on continuously throughout the year from the main sump in the east end of the pit, pumping either to the reservoir at the washing plant or over the south bank. A secondary sump was mined out and developed in the extreme southern part of the South Bovey pit bottom. The dirty water from this sump was pumped to an intermediate settling sump by low-head pumps.

An exploratory drilling program was conducted throughout the year in the South Bovey, the Mid-Snyder and the West Bovey forties and one deep hole in the proposed Hemmens stripping dump area was completed. Sample holes, to guide ore operations, were drilled in the South Bovey forty.

2. PRODUCTION, SHIPMENTS & INVENTORIES:

a. Production by Grades:

Snyder Crude,	864,695	tons
Bovey Crude,	721,533	"
Total Crude Ore,	1,586,228	"
Snyder Non-Bessemer Concentrates,	356,126	"
Snyder Bessemer Concentrates,	114,287	"
Bovey Non-Bessemer Concentrates,	232,932	"
Bovey Bessemer Concentrates,	151,293	"
Total Production,	854,638	"

b. Shipments:

Snyder Non-Bessemer Concentrates,	341,387	"
Snyder Bessemer Concentrates,	114,288	"
Bovey Non-Bessemer Concentrates,	232,932	"
Bovey Bessemer Concentrates,	151,293	"
Total Shipments,	839,900	"

c. Stockpile Inventories:

Snyder Stockpile Concentrates,	95,552	"

e. Production by Months:

	SNYDER	BOVEY	TOTAL
(1) Crude Ore:			
May,	119,241	100,662	219,903
June,	154,850	136,306	291,156
July,	160,354	140,154	300,508
August,	138,799	159,701	298,500
September,	169,449	109,455	278,904
October,	122,002	75,255	197,257
Total,	864,695	721,533	1,586,228

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2. PRODUCTION, SHIPMENTS & INVENTORIES: (Continued)

e. Production by Months:

(2) Concentrates	SNYDER	BOVEY	TOTAL
May,	72,873	50,888	123,761
June,	80,174	68,751	148,925
July,	84,104	71,315	155,419
August,	72,690	85,901	158,591
September,	92,782	65,078	157,860
October,	67,790	42,292	110,082
Total,	470,413	384,225	854,638

f. Ore Statement

As of January 1, 1947 there was a balance of 80,814 tons of Snyder concentrates in stockpile. This entire pile was shipped prior to the ore season and an overrun of 10,829 tons brought the actual weight of the stockpile up to 91,643 tons. During the 1947 season, 95,552 tons of Snyder concentrates were stocked during periods of car shortages and is in stock as of January 1, 1948.

g. Delays:

An accumulation of delays reported during the ore season amounted to 84 hours, of which 7 hours and 30 minutes were due to periods of power shortages. Delays for shovel repairs amounted to 13 hours and 30 minutes. Delays at the washing plant amounted to 62 hours and 45 minutes of which 23 hours were due to mechanical and electrical failures and the balance due to plugged chutes, waiting for empty ore cars and delays in stocking concentrates.

3. ANALYSIS

a. Mine Analysis of Production:

	Tons	Iron	Phos.	Sil.	Mang.	Alu.	Moist.	Fe. Nat.
Snyder N. B. Concts.	356,126	55.90	.080	11.16	.72	.49	8.07	51.39
Snyder Bess. Concts.	114,287	56.28	.036	11.38	.44	.49	7.89	51.84
Bovey N. B. Concts.	232,932	55.33	.071	11.29	1.08	.48	7.92	50.95
Bovey Bess. Concts.	151,293	56.34	.035	11.25	.44	.46	7.64	52.04
Total,	854,638	55.87	.064	11.24	.73	.48	7.93	51.44

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3. ANALYSIS:
(Continued)

b. Mine Analysis of Shipments:

	Tons	Iron	Phos.	Sil.	Mang.	Alu.	Moist.	Fe. Nat.
Snyder N. B. Concts.	346,387	56.17	.077	10.85	.72	.49	7.81	51.78
Snyder Bess. Concts.	114,288	56.28	.036	11.38	.44	.49	7.89	51.84
Bovey N. B. Concts.	232,932	55.33	.071	11.29	1.08	.48	7.92	50.95
Bovey Bess. Concts.	151,293	56.34	.035	11.25	.44	.46	7.64	52.04
Total,	839,900	55.98	.062	11.12	.73	.48	7.82	51.60

c. Analysis of Ore in Stockpile:

Snyder Concs.	95,552	55.36	.086	11.95	.65	.49	8.68	50.55

d. Analysis of Crude Ore Production:

Lease	Tons	Iron	Phos.	Sil.
Snyder,	864,695	42.92	.063	31.60
Bovey,	721,533	41.48	.053	33.54
Total,	1,586,228	42.26	.058	32.48

e. Complete Analysis of Season's Shipments:

	Iron	Phos.	Sil.	Mang.	Alu.	Lime	Mag.	Sul.	Loss
Snyder N.B. Concs.	56.17	.077	10.85	.72	.49	.27	.19	.011	6.67
Snyder Bess. Concs.	56.28	.036	11.38	.44	.49	.28	.19	.011	6.47
Bovey N. B. Concs.	55.33	.071	11.29	1.08	.48	.26	.18	.011	6.67
Bovey Bess. Concs.	56.34	.035	11.25	.44	.46	.28	.18	.011	6.11

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

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4. ESTIMATE OF ORE RESERVES: (Continued)

a. Developed Ore: (Continued)

	RESERVE 1-1-47	MINED 1947	BALANCE AFTER MINING	CHANGED BY RE-ESTIMATE	RESERVE 1-1-48
Bovey:					
S½-NE Sec.30	61,105	-	61,105	99,177	160,282
NW¼-SE Sec.30	191,411	23,054	168,357	227,155	395,512
NE-SE Sec.30	359,158	-	359,158	388,711	747,869
NE-NE Sec.31	1,164,155	361,171	802,984	1,021,690	1,824,674
NW-NW Sec.32	157,536	-	157,536	120,853	278,389
Total Bovey,	1,933,365	384,225	1,549,140	1,857,586	3,406,726
Hemmens:					
SW-SE Sec.30	2,788,112	-	2,788,112	347,935	3,136,047
Snyder:					
SE-SW Sec.30	1,021,375	-	1,021,375	238,321	1,259,696
SW-SE Sec.30	545,618	286,952	258,666	82,777	341,443
SE-SE Sec.30	635,243	183,461	451,782	287,966	739,748
Total Snyder,	2,202,236	470,413	1,731,823	609,064	2,340,887
Grand Total,	6,923,713	854,638	6,069,075	2,814,585	8,883,660

e. Estimated Analyses:

	Tons	Iron	Phos.	Silica	Mang.	Alu.
Bovey:						
Bess. Wash Concts.	950,490	57.60	.032	10.11	.31	.48
Non-Bess.Wash Concs.	1,612,722	57.34	.079	9.91	.60	.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,	3,406,726	56.99	.059	10.58	.46	.47
Hemmens:						
Bess. Wash Concs.	1,234,400	57.70	.032	10.23	.30	.47
Non-Bess.Wash Concs.	1,009,974	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,	3,136,047	56.96	.037	10.82	.32	.46

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4. ESTIMATE OF ORE RESERVES: (Continued)

e. Estimated Analyses: (Continued)

	Tons	Iron	Phos.	Silica	Mang.	Alu.
Snyder:						
Bess. Wash Concs.	870,340	60.21	.036	9.02	.18	.29
Non-Bess. Wash Concs.	1,308,659	59.60	.065	8.78	.31	.38
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,	2,340,887	59.54	.053	9.12	.27	.35
Total Bessemer,	3,603,440	58.06	.034	10.18	.27	.43
Total Non-Bessemer,	5,280,220	57.38	.060	10.36	.42	.44
Grand Total,	8,883,660	57.66	.049	10.29	.36	.44

5. LABOR AND WAGES:

a. Comments:

The supply of labor was adequate throughout the year. A new Union contract was signed May 28th, with a $.125 per hour raise retroactive to April 1st, and good labor relations were maintained throughout the year.

b. Comparative Statement of Wages & Product:

PRODUCTION	
Direct Shipping,	None
Concentrates Shipped,	759,086 tons
Concentrates in Stock 12-31-47	95,552 "
Concentrates in Stock 12-31-46	80,814 "
Total Production,	854,638 "
Number of Days Operated, (2 - 8-hour shifts per day)	145
Average Daily Production	5,894 tons
Average Wages Paid Per Day	11.696
Amount Paid for Labor,	$ 227,951.11

6. SURFACE:

a. Buildings and Repairs:

Ordinary maintenance work on mine buildings and dwellings was carried on during the year.

Two Butler steel buildings were purchased and delivered, but not yet erected; one 40 ft. x 140 ft. for cold storage of trucks, etc., at the shops and one 40 ft. x 60 ft. for truck service in the pit.

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6. SURFACE:
(Continued)

b. Roads, Transmission Lines, etc:

About 1,000 feet of road was built on the East Bovey forty by extending a waste dump to the Walker, completing a service road around the east side of the pit to the South Bovey stripping area.

A 22,000-volt transmission line from the washing plant across the East Bovey and Walker forties, a distance of 3/4 of a mile to the transformer site for Hemmens stripping conveyor, was started and about one-half completed.

7. OPEN PIT:

a. Stripping:

Stripping operations during 1947 consisted in extending the pit limits southward in the South Bovey forty, completing the program started in the fall of 1946, in a further extension of the pit to the north in the Mid-Snyder forty, and in removing lean formation, paintrock and sloughed material from the pit bottom. Using two shovels and as many of the trucks as could be kept in line, stripping was conducted on a 20-shift per week basis from the first of the year until the start of the ore season on May 5th.

During the mining season a rather extensive stripping program had been planned, mining and stripping concurrently on the day and afternoon shifts and devoting the third shift of each day to stripping. Lack of sufficient loading and haulage equipment resulted in but little stripping concurrent with the mining, leaving the bulk of this work to the third shift each day. This work was further cut down through the necessity of using all three shovels in ore at times to insure peak production.

Full scale stripping operations were resumed again after the end of the ore season in the first part of November and conducted again on a 40-hour, 20-shift per week basis until the end of the year. In this operation, a swing crew was used and the men were worked 40 hours per week. During the year, a total of 1,666,637 cubic yards of waste and lean material was removed in 713 shifts and satisfactory stripping costs were secured despite numerous equipment failures and other operating delays. The average cost of stripping for the year 1947 was $.2750.

In the South Bovey extension, which was in progress at the beginning of the year, a total of 406,107 cubic yards of material was removed. This consisted of 243,824 cubic yards of surface, 161,577 cubic yards of waste material and 706 cubic yards of lean ore. One 5-yard and a 3-1/4-yard Bucyrus-Erie shovel and as many trucks as could be obtained, were used on this work. Progress made was quite satisfactory, although the work entailed a long haul from the extreme depth of 175 feet to the top of the high dump which has been built up over 125 feet above the normal elevation of the ground, south of the pit. However, progress made was satisfactory and good

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7. OPEN PIT:
(Continued)

a. Stripping: (Continued)

stripping costs on this work were secured. After completing the South side stripping in February, operations were shifted to the north side of the Mid-Snyder forty, in the vicinity of the washing plant, and from the first of March until the beginning of the ore season, 473,140 cubic yards of surface, waste and ore material were removed. This material was hauled to stripping dumps, north of the pit, and fair progress was made, although frost conditions were rather extreme and the haulage conditions were quite slippery during the early spring thaws. Early in May, the stripping shovel was moved to the pit bottom, where lean and waste ore, paintrock and sloughed material were removed mainly on the third shift during the operating season, with an occasional operation concurrent with the mining on the day and afternoon shifts. A total of 417,698 cubic yards was removed at this time and excellent costs were secured on this work, due to the fact that part of the overhead was carried on ore and haulage and stripping conditions were ideal. This was only a part of an extensive stripping program which had been planned but could not be carried out through lack of equipment.

After the completion of the ore season, stripping operations were again resumed in the South Bovey lease, in an extension of the pit limits. The work was again conducted on a 40-hour, 20-shift per week basis. Repairs to the 120-B shovel made it necessary to shift part of the crew to the pit bottom at times, where waste ore material was moved with a 3-1/4-yard shovel in the bottom of the South Bovey. In the surface stripping operations in the upper benches, conditions were very similar to those in January and February, with deep stripping, a high dump, difficulties in maintaining sufficient haulage trucks and other pit delays. A total of 260,708 cubic yards of surface material was removed from this area. In the South Bovey pit bottom, 94,484 cubic yards of waste ore material and 14,500 cubic yards of paintrock were removed and placed on dumps in the bottom of the pit. The total post-ore season stripping amounted to 369,692 cubic yards.

The following tabulation shows the yardages, by leases, of the various materials stripped during 1947 at the Canisteo Mine:

Lease	Surface	Waste	Lean Ore	Rock	Total
Snyder,	151,283	343,535	10,405	17,785	523,008
Bovey	557,683	485,141	84,947	2,845	1,130,616
Hemmens	-	13,013	-	-	13,013
Total,	708,966	841,689	95,352	20,630	1,666,637

g. Open Pit Mining and Loading:

Ore production was started on May 5th and continued through October 25th and, with the exception of the first few weeks, the pit operations were conducted on a 2-shift, 6-day per week basis. A total of 1,586,228 tons of crude ore was mined and treated, to produce

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7. OPEN PIT:
(Continued)

g. Open Pit Mining and Loading: (Continued)

854,638 tons of concentrates, with an average weight recovery of 53.88%. The low weight recovery was due to the absorption of a large proportion of low grade lean limonitic ore. This was used to bring down the high silica in the hematite ores and to bring up the production of Bessemer grade. Two shovels were kept in the ore operation at all times and occasionally it was necessary to use the third, or stripping shovel, in order to save time in shovel moves and to bring about peak ore production. Pit operations were extremely good and a high output of crude was maintained at all times.

Mining operations were carried on in the South and West Bovey forties, and in the East and Mid-Snyder. A total of 470,413 tons of concentrates was produced from the latter lease, consisting of 183,461 tons from the East Snyder and 286,952 tons from the Mid-Snyder. The output from the Bovey leases amounted to 384,225 tons of concentrates, 23,054 tons of which were taken from the West Bovey and 361,171 tons from the South Bovey.

In the Snyder operations, low grade limonitic ores were mixed with higher grade hematites, both in the pit bottom on the south side and in the north side of the Mid-Snyder forties. A small amount of high manganese ore was sorted out in the latter area. A part of the estimated Bessemer production was lost through the occurrence of manganese in the upper areas on the north side of the Mid-Snyder. The mining in the South Bovey was similar to that in the Snyder, mixing high and low grade materials to secure a uniform output of concentrates. A large tonnage of very lean crude ore was absorbed from the upper benches of the South Bovey. In this area, the manganese and the phorphorus were both extremely spotty and it was necessary to move shovels quite frequently for the grading of the ore. The occurrences of the manganese in the big block of ore from this area made it necessary to stock some crude material in the pit and re handle the same when the manganese could be absorbed. It likewise held up the development of the higher grade layers of ore in the lower benches. In the South Bovey, both Bessemer and non-Bessemer ores were produced in all horizons. The crude ore secured from the West Bovey was of mediocre grade, with a high silica content.

k. Drainage:

The water level in the main sump, in the east end of the pit, was maintained at approximately 490 elevation, as in the previous years, but the secondary sump was extended to the west and deepened to the south to about 450 elevation in the South Bovey. This will be developed into the future main sump.

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8. COST OF OPERATION:

a. Comparative Mining Cost:

	BUDGET ESTIMATE	COST PER TON 1947	COST PER TON 1946
PRODUCT:			
Concentrates,	800,000	854,638	547,398
Average Tons Per Shift		2,947	2,339
Tons Per Man Per Day		43.84	39.53
Days Operated		145	98
COST:			
Open Pit Mining	$ .266	$ .249	$ .234
General Pit Expense	.064	.041	.064
Concentrating	.138	.107	.118
Stocking and Loading Concentrates	.007	.012	.007
General Mine Expense	.116	.100	.096
Idle and Winter Expense	.160	.196	.141
Cost of Production,	$ .751	$ .705	$ .660
(Amortization of Leasehold)	.203	.156	.172
Depreciation - Plant and Equipment	.041	.041	.038
Depreciation - Motorized Equipment	.070	.047	.063
Amortization - Stripping	.370	.388	.260
Taxes - Ad Valorem	.152	.152	.156
Taxes - Occupational	.140	.136	.121
Taxes - Royalty	.040	.040	.032
Total Cost at Mine,	$ 1.767	$ 1.665	$ 1.502
Miscellaneous Expense and Income	.000	.004	.000
Grand Total,	$ 1.767	$ 1.661	$ 1.502

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8. COST OF OPERATION: (Continued)

d. Detailed Cost Comparison:

(1) Product

The annual production figures for 1947 and 1946 afforded little similarity for comparative costs with the 1947 season having the advantages of greater production; however, the increased costs of labor and material during 1947 more than offset the greater production advantage. The cost of production showed a substantial saving as compared with the budget, and compared favorably with the 1946 figures, even though the 12½¢ raise, plus overtime for a six-day operation, increased the average wage paid per day from $9.856 in 1946 to $11.696 in 1947. The favorable costs secured were due mainly to increased efficiency by maintaining a constant flow of ore to the plant.

(2) Open Pit Mining:

In mining crude ore, the 1947 costs were higher than 1946 costs, but under the budget. The increase over 1946 was in Drilling and Blasting; almost entirely due to a 28% increase in cost per pound of explosives. The larger items of Operating and Maintenance of shovels and trucks were held to the 1946 figure, below the budget, by larger tonnage and efficient operation.

(3) General Pit Expense

The budget for this heading was set at $.064, the 1946 figure. The 1947 cost was $.041, due principally to less exploratory drilling than planned, saving $.018. The larger tonnage per shift more than offset the increased season cost of pumping more water from a greater depth.

(4) Concentrating

The 1947 concentrating cost of $.107 was under the 1946 cost of $.118 and the budget of $.138. The constant maximum flow of ore through the plant increased repair of machinery by $.004, but the same efficiency and a slight increase in tonnage recovery lowered the power costs by $.014.

(5) Stocking and Loading Concentrates

Stocking and loading costs were higher than 1946 and the budget, principally because all the installation charges of the new fixed conveyor stockpiling system were absorbed. The tonnage stocked, 95,552 tons, was also larger than anticipated.

(6) General Mine Expense

General Mine Expense was lower than estimated and only slightly over 1946 costs. Most of the numerous items check very closely; higher Geological and Insurance costs were about balanced by lower District Office Expense which was spread over more mines.

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8. COST OF OPERATION: (Continued)

d. Detailed Cost Comparison:

(7) Winter and Idle Expense:

This heading at $.160 shows up exactly the same as the budget, higher than the 1946 costs which had special credits, but the final figure from Cleveland will be nearly $.200 because of retroactive wage adjustments and large charges for shovel and truck repairs.

9. EXPLORATIONS AND FUTURE EXPLORATIONS:

A total of 2,072 feet of structural drilling was completed during the year, consisting of 1,681 feet of exploratory work and 391 feet of sample drilling.

The sample drilling was done in the South Bovey bottom to guide shovel operations.

Exploratory drilling in the South Bovey amounted to 528 feet and showed enough marginal ores in the upper horizon with better grade ores at depth to warrant further pit extension to the south.

Similarly, a north pit extension into the West Bovey from the Mid-Snyder is being explored; 425 feet were drilled during the year, showing upper ores of good grade under deep surface and waste. This program is being continued.

In the Hemmens dump site area, 728 feet were drilled to prove the barren character of the formation before covering with more surface material. One deep hole, 656 feet, was completed to quartzite and a second shallow one started; the drilling continues.

10. TAXES:

The following statement shows the Canisteo Mine taxes and the average annual rates for 1947 and 1946:

	1947	1946	Increase	Decrease
Canisteo Mine	$121,158.41	$76,696.00	$44,462.41	
Washing Plant and Auxiliary Lands,	962.85	879.83	83.02	
Personal Property,	7,517.15	7,924.54	-	$ 407.39
Total,	$129,638.41	$85,500.37	$44,138.04	
Village Lots,	221.92	221.57	.35	
Grand Total,	$129,860.33	$85,721.94	$44,138.39	
Average Tax Rate,	125.29	125.06	.23	

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10. TAXES:
(Continued)

The increase in Canisteo Mine taxes accounted for by a larger reserve tonnage, due to a revised estimate.

The increase in Washing Plant and Auxiliary Lands is due to having included in 1947 taxes, additional property leased from Oliver Iron Mining Company on which the taxes had formerly been paid by Canisteo Mining Company.

Decrease in Personal Property taxes is due to smaller tonnage of ore in stockpile in 1947. Additions in equipment were off-set by the usual depreciation taken on personal property.

11. ACCIDENTS AND PERSONAL INJURY:

Name: Robert Bogdonovich June 24th.
Cause: While putting a sample through the rolls, he used a fire-shovel to push a large rock through the rolls. He tried to force the rock through with the handle of the shovel. The handle of the fire-shovel was drawn down into the rolls and his left hand was squeezed between the scoop part of the shovel and the guard above the rolls.

Time Lost: 11 Days

Compensation: *$624.00 to date.

* Will be paid a total of $1,757.60 for loss of thumb and half loss of ring finger, a total of 70 weeks.

12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION

A new stocking conveyor was completed and proved very satisfactory for the first 50,000 tons. This consisted of a short 36 inch conveyor under the concentrate bins feeding a 190 foot, 24 inch conveyor inclined to a height of 40 feet over the stockpile grounds. Two new 60 foot portable stackers distributed the discharge of the inclined, fixed conveyor. When stocking beyond 50,000 tons, it becams necessary to spread with one and sometimes two dozers, and also to slow the plant to two-thirds feed. It is proposed to add a third portable stacker for 1948 to cut down dozer expense, to keep tonnage per hour up to normal and to segregate grades in the pile.

On the proposed stripping conveyor installation, 500 feet of sub-base was graded, piers for trestles over railroad and highway

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION

were poured, and 1,200 feet of ditch dug for a concrete culvert to carry natural drainage from the north under the stripping dump. This culvert will be 1,650 feet long. Assembly of trusses and conveyor pan supports was started. The whole stripping conveyor system consists of a 7-W dragline, 6,000 feet of used 36 inch conveyors, screening plant, hoppers, launching stacker, motors, drives, etc. Much of the material has been delivered and is to be erected in 1948.

13. EQUIPMENT AND PROPOSED EQUIPMENT:

New equipment received in 1947 consisted of two Walters 15-ton trucks, two Euclid 20-ton trucks, one Ford service truck, one International pickup truck, one heavy duty trailer and a Reo truck, one mobile crane and dragline bucket, one Tournadozer, and two 24 inch x 60 foot portable stackers. Deliveries on most equipment was slow during the year, but improving, except for most electric motors.

Proposed equipment for 1948 delivery is: one Bucyrus-Erie 7-W dragline; one D-8 "Caterpillar" tractor; one "Caterpillar" #112 motor grader; four 22-ton Euclid trucks to replace old units; one 30 inch x 60 foot portable stacker for stocking concentrates; one 27-T blast hole drill and some pumps and screens for the washing plant.

14. MAINTENANCE AND REPAIRS:

The 85-B, 3-1/4-yard shovel was overhauled at the shop before stockpile loading started in April. The 120-B and the P. & H. shovels were given the necessary running repairs in the pit, but they could not be spared at any time for a complete overhaul job. The maintenance and repairs of motorized equipment was carried on continuously, with little time to major overhauls. The equipment, in general, is now showing the effect of several years of continuous operation, with little or no time for complete overhauls and rebuilding. The purchase of the P. & H. shovel was fortunate for the Canisteo, for it afforded sufficient machines for a good production in both stripping and mining and it afforded time for overhauling the 85-B shovel. It will be necessary, during 1948, to completely overhaul the major machines, and in the motorized equipment, to replace all older machines that require excessive maintenance.

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14. MAINTENANCE AND REPAIRS: (Continued)

The usual washing plant repairs were carried on before and after the ore season and a good maintenance program during the operating season prevented any great loss of time through equipment failures.

19. WASHING PLANT OPERATIONS:

The concentrating plant was operated on the same basis and on the same schedules as the ore loading in the pit, winding up the season on October 25th. A total of 1,586,228 tons of crude ore was washed to produce 854,638 tons of concentrates. The average weight recovery was 53.88%, as compared with 52.64% in 1946. The high continued output of crude ore resulted in an average output of nearly 3,000 tons of concentrates per shift, which is an all-time high for the Canisteo Mine; or, in fact, any of our concentrating plants. There were few mechanical delays in the plant and the high efficiency in plant production was further aided by a good equipment maintenance program throughout the season.

During the operating season, experiments were conducted to increase the density in the Akins classifiers by a recirculation of a part of the high grade concentrates. This worked out very successfully and densifiers will be installed in the Canisteo plant for the 1948 ore season. It is expected that they will improve the grade of concentrates by 1% to 1½% in natural iron. On this basis, the installation will pay for itself the first year.

In order to hold delays to a minimum it was necessary to stock concentrates during periods of empty car shortages, and a total of 95,552 tons was stocked during the 1947 ore season. The new stockpile stacking conveyor was used for this purpose and eliminated the necessity of hauling the concentrates by truck, with the mining delays that would necessarily be caused by truck shortages in the pit when production trucks have to be used for stocking concentrates.

The following tabulation shows the tonnage and analyses of the plant rejects, the pit rejects and the lean ore and other materials removed during the mining operation

	5 x 14 Screen Rejects			
Lease	Tons	Iron	Phos.	Silica
Snyder,	24,317	23.58	.027	62.39
Bovey,	15,480	23.35	.024	64.07
Total,	39,797	23.49	.026	63.04

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19. WASHING PLANT OPERATIONS: (Continued)

Lease	36" Belt Rejects Tons	Iron	Phos.	Silica
Snyder,	255	28.89	.029	56.67
Bovey,	879	26.81	.028	59.86
Total,	1,134	27.28	.028	59.14

The analysis of the product from the various machines for the year was as follows:

Lease	Log Washer Iron	Phos.	Silica	Classifier Iron	Phos.	Silica	Tailings Iron
Snyder,	55.17	.067	11.91	55.88	.057	11.20	26.18
Bovey,	55.13	.068	11.83	55.84	.058	11.25	25.83

The concentration data for the year was as follows:

	Tonnage	% of Total Mined	% Dried Iron	Tonnage Recovery	Iron Unit Recovery
Material removed in mining,	1,626,025	100.00	41.80		
Less: Lean ore Stocked in mining,	-	-	-		
Less: Pit Rock Wasted,	-	-	-		
Total Transported to Mill,	1,626,025	100.00	41.80		
Less: Rock Rejects in Screening Plant,	39,797	2.45	23.49		
Crude Ore Entering Mill	1,586,228	97.55	42.26		
Concentrates Produced	854,638	52.56	55.87	53.88	71.25
Rock Rejects on Mill Picking Belt,	1,134	.07	27.28		
Tailings (By Deduction)	730,456	44.92	26.36		
Total Pit Rock, Screen Plant Rejects and Lean Ore,	39,797	2.45	23.49		
Total,	1,626,025	100.00	41.80		

HAWKINS MINE

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1. GENERAL:

The Hawkins Mine, with the International Harvester properties, was taken over by The Cleveland-Cliffs Iron Company on March 1st,1947, after having been shut down for fourteen months during the strike. An agreement was made with the local CIO Union on March 15th and work was immediately started on the preparation for the 1947 ore season.

In the shops and at the concentrating plants, repairs to equipment, which had been underway at the time of the strike, were carried forward with as much dispatch as possible, rushing equipment which would be used for stockpile loading with the opening of navigation on the Great Lakes. Repairs on mining and concentrating equipment was pushed forward as much as possible, for an early opening of the 1947 ore season. The two 85-B 3-1/2-yard electric production shovels were repaired and the necessary repairs were given the two small electric shovels which were to be used in stockpile loading. Four steam locomotives were likewise made ready for early stockpile loading and the necessary switching around the Hawkins Mine.

Stockpile loading of the Hawkins regular concentrates and the fine ore stockpiles for the International Harvester account, was started on April 9th. The greater part of both of these piles was loaded out during the month of April, leaving a small balance to be cleaned up after frost and other ground conditions would permit, late in May and early in June. It was necessary that the piles be thoroughly cleaned up for this ore was owned by Harvester and could not be inter-mixed with ore which later might be stocked by Cleveland-Cliffs.

In the pit, tracks were readied for mining operations and a small yardage of pit rock and other waste material was cleaned up. In addition, the sub-level drifts, used for pit drainage, were retimbered by a crew of miners from the Sargent Mine.

The 1947 ore season was started on Monday, May 12th, and, during the first week, mining operations were conducted on a single shift, 6-day per week basis. On May 19th, this was stepped up to a 2-shift, 6-day per week basis and continued at that rate until the completion of the ore season on October 11th. A total of 1,049,024 tons of crude ore was mined and washed to produce 620,416 tons of concentrates in 246 - 8-hour shifts. The average output per shift was 4,264 tons.

Operating on the same basis as the pit, the concentrating plant produced a total of 620,416 tons, with an average output of 2,522 tons of concentrates per shift, and a weight recovery of 59.14%. Operating delays at the plant were about average and, on the whole, the concentration operation was satisfactory. After the completion of the ore season, the usual clean up and winter repair operations were started immediately

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1. GENERAL:
(Continued)

at the plant, with numerous plant changes through the elimination of coarse screening at the plant and to simplify and improve the flowsheet. The ball jigs were discarded and preparations made to improve the fine ore concentrating operations.

In the pit, the removal of all pit tracks was rushed in order to complete this work before the advent of cold weather. Preparatory work for the installation of the conveyor system likewise got underway. This included a haulage road from the shops to the pit bottom, grading for the conveyor, the removal of approximately 122,759 tons of crude wash ore from the site of the pit screening plant and lower section of the conveyor, and the grading and preparation of the track bed for loading tracks leading to the pocket at the head end of the conveyor.

At the shops, in addition to servicing the underground mines, the usual winter repair and maintenance operations were carried forward.

2. PRODUCTION, SHIPMENTS & INVENTORIES:

a. Production by Grades:

Hawkins Crude,	1,049,024	tons
Hawkins Bessemer Concentrates #2,	116,146	"
Hawkins Non-Bess. Concentrates #2,	350,545	"
Hawkins Non-Bessemer Fines,	153,725	"
Total Production,	620,416	"

b. Shipments:

Hawkins Bessemer Concentrates #2,	116,146	"
Hawkins Non-Bess. Concentrates #2,	309,304	"
Hawkins Non-Bessemer Fines,	153,725	"
Total Shipments,	579,175	"

c. Stockpile Inventories:

Hawkins Stockpile Concentrates #2,	41,241	"

e. Production by Momths:

(1) Crude Ore

May,	127,453	"
June,	229,069	"
July,	227,523	"
August,	218,485	"
September,	174,015	"
October,	72,479	"
Total,	1,049,024	"

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2. PRODUCTION, SHIPMENTS & INVENTORIES: (Continued)

e. Production By Months: (Continued)

(2) Concentrates:

	HAWKINS COARSE	HAWKINS FINES	TOTAL
May,	51,462	18,980	70,442
June,	103,498	34,033	137,531
July,	105,900	30,718	136,618
August,	100,789	28,643	129,432
September,	72,178	27,845	100,023
October,	32,864	13,506	46,370
Total,	466,691	153,725	620,416

f. Ore Statement:

Total shipments from the Harvester Company's stockpile amounted to 105,356 tons of Coarse #2 concentrates and 10,398 tons of fines concentrates. The majority of this tonnage was used in straight Harvester cargoes.

g. Delays:

The delays incident to the plant operation during the year consisted of 76 hours of washing plant equipment delays, 260 hours of delays waiting for crude ore on account of pit operations, and 40 hours of waiting for Great Northern empty cars. The crude ore delays were the result of equipment failures in the pit, derailments and broken car journals on the rail haulage and power failures and slides, due to storms.

3. ANALYSIS

a. Mine Analysis of Production:

	Tons	Iron	Phos.	Silica	Mang.	Alum.	Moist.	Fe. Nat.
Hawkins #2 Bess. Concts.	116,146	56.64	.035	10.77	.28	.43	6.76	52.81
Hawkins #2 Non-Bess. Concts.	350,545	55.97	.042	11.63	.66	.44	7.33	51.87
Hawkins Non-Bess. Fines,	153,725	54.51	.036	15.76	.45	.50	8.70	49.77
Total,	620,416	55.74	.039	12.50	.54	.45	7.56	51.53

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3. ANALYSIS:
(Continued)

b. Mine Analysis of Shipments:

	Tons	Iron	Phos.	Silica	Mang.	Alu.	Moist.	Fe.Nat.
Hawkins #2 Bess. Concts.	116,146	56.64	.035	10.77	.28	.43	6.76	52.81
Hawkins #2 Non-Bess.Concts.	309,304	55.96	.042	11.54	.66	.45	7.32	51.87
Hawkins Non-Bess. Fines,	153,725	54.51	.036	15.76	.45	.50	8.70	49.77
Total,	579,175	55.81	.039	12.51	.53	.46	7.58	51.58

c. Mine Analysis of Ore in Stockpile:

Hawkins #2 Concts.	41,241	56.01	.042	12.28	.65	.39	7.42	51.85

d. Average Analysis of Crude Ore Production:

Hawkins Crude,	1,049,024	40.93	.033	35.67				

e. Complete Analysis of Season's Shipments:

	Iron	Phos.	Sil.	Mang.	Alu.	Lime	Mag.	Sul.	Loss.
Hawkins #2 Bess. Concts.	56.64	.035	10.77	.28	.43	.29	.20	.011	6.83
Hawkins #2 Non-Bess.Concts.	55.96	.042	11.54	.66	.45	.29	.19	.012	6.46
Hawkins Non-Bess.Fines,	54.51	.036	15.76	.45	.50	.27	.19	.012	4.60

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 1-1-47	Mined 1947	Reserve 1-1-48
SW¼-SW¼ 32, 57-22,	795,867	341,200	454,667
NW¼-SW¼ 32, 57-22,	914,380	31,016	883,364
SE¼-NW¼ 31, 57-22,	379,779	124,100	255,679
NE¼-SE¼ 31, 57-22,	2,488,598	124,100	2,364,498
Total,	4,578,624	620,416	3,958,208

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 estimate of the International Harvester Company, less the ore mined during the 1947 ore season.

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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	Iron	Phos.	Silica	Mang.	Alu.	Moist.	Fe. Nat.
3,958,208	57.48	.053	11.90	.46	.55	7.29	53.29

5. LABOR & WAGES:

a. Comments:

Following the settlement of the Harvester strike, no further labor trouble was encountered and there was sufficient labor on hand at all times to supply the requirements. The average hourly wage was increased $.12-1/2 per hour, making the basic common labor $1.09 per hour, effective April 1st.

b. Comparative Statement of Wages and Product:

Concentrates Shipped,	579,175 tons
Concentrates in Stock,	41,241 "
Total,	620,416 "
Number of Days Operated,	126
Number of Shifts Operated,	246
Average Daily Product,	4,924
Average Product Per Shift,	2,522
Average Number of Men Working,	135
Average Wages Per Hour (Ore Season)	1.376
Amount Paid For Labor " "	$227,895.99

6. SURFACE:

A. Buildings, Repairs:

Continuing a general maintenance program on the ming buildings and dwellings at the Hawkins Mine, the exterior of three of the fourteen dwellings were painted during the year and the interior work on three others was completed. No improvements, aside from small maintenance jobs, were made on the mine buildings.

At the washing plant, steel was received and preparations were made for the erection of a change-house. This work will be completed in the spring.

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6. SURFACE:
(Continued)

a. Buildings, Repairs: (Continued)

At the mine shops, the steel work for a sectional truck and tractor storage building was received. Foundations were poured and the erection will be carried forward in the early spring.

b. Tracks, Roads, Transmission Lines:

With the change-over from rail haulage to a combination of truck and conveyor haulage, all of the pit tracks were removed.

A main approach road was constructed along the east crest of the pit and a temporary road was constructed to the pit bottom. A permanent approach road into the pit will be constructed during the 1948 ore season, along with the mining operations.

A new telephone line was built to the concentrating plant and a new high power transmission line was built from the main transformer station near the highway to the head end of the conveyor system on the East bank of the pit.

7. OPEN PIT:

a. Stripping:

There was no stripping operation in the past year, and what rock and surface that was excavated, was necessitated by the construction of the new conveyor system and roads thereto.

g. Open Pit Mining & Loading:

Mining operations for the 1947 ore season were started on May 12th and continued until October 11th, when the tonnage requirements were completed. They were conducted on a two 8-hour shift per day, six shift per week basis, except for the first week, which was on a single shift basis. A total of 620,416 tons of concentrates was secured in the mining and treating of 1,049,024 tons.of crude ore. The average output of crude ore was 4,264 tons per shift. Mining was conducted with two 85-B 3-1/4-yard electric shovels and five trains of six 20-yard cars each, hauled by 65-ton steam locomotives. Approximately 60% of the crude ore was mined from the pit bottom, entailing an extremely long haul. One of the 3-1/2-yard electric shovels spent the entire ore season in the pit bottom, extending the limits of the same and mining out the island area, leaving but a very small tonnage in the pit which could be mined and hauled by rail haulage. The second shovel operated in the upper ore benches on the northeast side of the pit, near the Townsite, until early in September. It was then shifted to the south end of the pit to clean up the ore in the intermediate benches in the vicinity of the new screening plant site.

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7. OPEN PIT:
(Continued)

g. Open Pit Mining & Loading: (Cont'd)

In the pit bottom, a good grade of wash ore was mined throughout the entire season and was mixed in varying proportions with the leaner material which was taken from the upper benches. Mining conditions in the pit bottom were good, little rock was encountered and the drainage offered no problem. In the upper benches on the northeast side, however, considerable rock was encountered, part of which had to be sorted out and loaded separately in the pit, the remainder being scalped off at the screening plant at the concentrator. The excessive amount of rock encountered slowed down the production considerably at times through the delay in handling rock cars and rock trains in the pit, and in disposing of the extra rock at the washing plant. The operations in this area were more in the nature of a scram. The ore encountered varied from a high grade wash to a lean jig material and had to be graded up by better ore which was secured from the pit bottom.

In general, the pit operations were well conducted and were satisfactory in view of the operating conditions. The 1947 season marked the end of rail haulage in the pit. This system is being replaced by a combination of truck haulage in the pit, conveyor belt delivery and a loading pocket on surface, and rail haulage with two Diesel electric-operated trains from the pocket to the concentrating plant.

h. Blasting:

With operations so close to the village proper, it is necessary to use extreme care in all blasting operations, reducing, as much as possible, the number of holes fired in each blast. This care is exercised to avoid the contingent liability from broken windows, falling plaster and other damage from blasting to buildings in the town site near the east side of the pit. During the past year there were but few complaints.

k. Drainage:

The pit is drained through the utilization of the main and timber shafts and a part of the former underground workings, with drifts extending out under the pit bottom. In the underground pumphouse, two Ingersoll-Cameron high-head centrifugal pumps are operated by the mine and the Village of Nashwauk has a 400-gallon, 500-foot head pump to augment the village water supply. The power expense and the maintenance on the latter are borne by the village. During the past year, from March 1st to December 31st, -$14,333.00 was expended by the Hawkins Mine and $2,310.38 by the village for power for mine dewatering.

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8. COST OF OPERATION:

a. Comparative Mining Costs:

	1947 BUDGET	1947 COST PER TON
PRODUCT: (Tons)	600,000	620,416
Average Shift Production,		522
Tons Per Man Per Day,		18.68
Days Operated,		126
COST PER TON:		
Open Pit Wash Ore,	$ .245	$ .250
General Pit Expense,	.088	.050
Concentrating,	.198	.232
General Mine Expense,	.098	.116
Idle and Winter Expense,	.170	.120
Cost of Production,	$ .799	$ .768
Purchase of Plant & Equipment,		.180
Depreciation - Plant & Equipt, and Motorized Equipment		.009
Taxes - Ad Valorem,		.120
Taxes - Occupational,		.020
Taxes - Royalty,		.091
Total Cost at Mine,		$ 1.188
Administrative Expense,		.055
Miscellaneous Expense & Income,		.003
GRAND TOTAL,		$ 1.240

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9. EXPLORATIONS AND FUTURE EXPLORATIONS:

A comprehensive drilling program has been planned to furnish the necessary information for a complete re-estimate of the Hawkins ore body. Information available to date is very sketchy without sufficient drill holes on which to base a sound estimate. This program has been started, using one of the Company blast hole drills to churn through the heavy rock formations where the latter exists and drilling from there under contract with the Leach Drilling Company. After the delivery of a structure drill attachment for one of the 27-T blast hole drills, it is planned to use a second drill on this work so that the same can be expedited.

During the past year, a total of seven structure holes were completed at a total footage of 392 feet by the drilling contractor. In addition, 515 feet of rock capping was drilled with the Company blast hole drill. The drilling in the balance of the pit has not advanced sufficient to warrant any estimate as to an increase or decrease in tonnage.

10. TAXES:

a. Statement of Taxes:

Hawkins Mine, ----------	$ 65,094.62
Hawkins Mine Washing Plant, ----------	3,834.57
Hawkins Mine Auxiliary Lands, ----------	1,084.12
Hawkins Mine Personal Property, ----------	4,458.21
Total Taxes, ----------	$ 74,471.52

11. ACCIDENTS AND PERSONAL INJURY:

There were three lost-time accidents at this property during the Year 1947, which are described as follows:

Name: John Kautto Date: July 3rd.
Cause: Kautto was a member of the track gang and as they were riding on the speeder, one of the men attempted to put gasoline in the tank. The motor caught fire and all the men jumped from the speeder while it was in motion. When Kautto jumped he fell and hit his face against a sharp rock.

Nature: Deep cut through left nose from eye and lip, exposing inside of nose full length. Eye not injured. Mouth not injured apparently.
Time Lost: 2 Weeks - 3 days
Compensation: $40.50.

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11. ACCIDENTS AND PERSONAL INJURY: (Continued)

Name:	Archie L. Bass	Date: July 7th.
Cause:	He was helping to put a heavy shaft on a couple of steel horses and while he was standing nearby, a fellow worker attempted to shove a horse further under the steel shaft, causing the shaft to fall off the horse onto Bass' left foot.	
Nature:	Fractured left foot. Film shows fracture near distal and 1st and 2nd metatarsals; good position.	
Time Lost:	2 Weeks - 5 days.	
Compensation:	$49.50.	

Name:	Arthur L. Schalin	Date: July 15th.
Cause:	Schalin dropped one of his gloves from a window on the jig floor to the roof of the loading platform. He then went below to the loading platform and climbed up on the guard railing to get the glove. He slipped from the railing and fell to the railroad track about fifteen feet below.	
Nature:	Patient unconscious. Has cut 2" long on chin and small cut external to left eye. Does not seem to be any fracture.	
Time Lost:	Eight weeks.	
Compensation:	$216.00	

12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION

Due to the fact that at the close of the 1947 ore season there was but a small tonnage of ore which could be mined through rail haulage in the pit, it was necessary to install a complete conveyor system from the pit bottom to the east bank to facilitate the mining of the remaining ore in the Hawkins. The system would include a pit screening plant, with a drive-over pocket, pan feeders and a screen for the screening or scalping of the undersize and the delivery of the undersize to the conveyor flights, two flights of conveyor, one approximately 560 feet in length and the other 509 feet, with a total lift of approximately 255 feet, and a railroad pocket on the east bank of the pit for delivery of the crude ore from the conveyor system into railroad cars for transportation to the concentrating plant. A 30" belt will be used, capable of delivering 700 long tons of crude material per hour. Good progress was made on the preparation of the sites for the crude ore bin and the screening plant, and the grades for the loading tracks were prepared. A contract was let for the erection of the screening plant, the crude ore bin and the conveyor flights, with the assumption that the complete system would be ready for operation the first of May, 1948.

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION: (Continued)

The system of truck haulage and conveyor belt delivery will likewise require the auxiliary haulage roads, transmission lines and other services. It will likewise require the building of a service garage in the pit and a truck storage garage at the plant site. Preparations are being made for the latter and it is thought that they will all be ready for use early in the 1948 ore season.

13. EQUIPMENT AND PROPOSED EQUIPMENT:

Equipment received at the Hawkins Mine during the past year consisted of 2 - 65-ton Whitcomb Diesel electric locomotives; seven 20-ton Euclid rear-dump trucks, equipped with one Model 512 Adams motor grader, equipped with International Diesel motor; one TD-18 International tractor; two 3/4-ton International pick-up trucks and one International service truck.

It is proposed to add the following equipment during the coming year: One 54-B electric 2-1/2-yard Diesel shovel for pit clean up, stockpile loading, etc., - one 42-T 9" blast hole drill for drilling through the heavy rock capping, both for exploration and stripping; a bit dresser and furnace to handle the sharpening of bits for the 9" drill; one KB-1 International panel truck for the use of the engineers.

19. WASHING PLANT OPERATIONS:

Operating on the same basis as the pit, the washing plant started on May 12th and completed the concentrating operations on October 11th, with a total of 246 shifts. Operations were satisfactory throughout the year, despite delays due to rail haulage and slow operating conditions in the pit. During the 1947 season, a total of 620,416 tons of concentrates was produced in the treatment of 1,049,024 tons of crude ore. The average output per shift was 2,522 tons. During the year it was clearly demonstrated that the jigs in operation at the plant were not effective and that it was poor economy to continue their use. It was also developed that there was not sufficient capacity in the single hydroseparator and the three hydrosizers to efficiently handle the fines at this plant and that a better balanced unit of two hydroseparators and four hydrosizers should be set up for the 1948 operation. In addition, it was likewise decided that individual drives should be placed on several of the concentrating units to do away with the cumbersome and inefficient line shafting. These changes would be taken care of during the fall and winter repair and re-construction program.

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19. WASHING PLANT OPERATIONS: (Continued)

A shortage of railroad cars at various times during the season made it necessary to stock 41,241 tons of regular concentrates at the Hawkins during the 1947 ore season. The fines stacking conveyor was used for this purpose and worked efficiently, although it was demonstrated that a larger motor should be placed on the conveyor drive.

The amount and analysis of the plant rejects for the 1947 season was as follows:

5 x 14 Screen Rejects

Tons	Iron	Phos.	Silica
121,793	16.66	-	71.79

36" Belt Rejects

5,730	16.66

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

Tons	Iron
35,688	31.05

The analysis of the product for the various machines is as follows:

Log Washer			Classifier			Tailings
Iron	Phos.	Silica	Iron	Phos.	Silica	Iron
56.07	--	11.58	54.13	-	16.03	20.70

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19. WASHING PLANT OPERATIONS: (Continued)

	Tonnage	% of Total Mined	% of Iron Dried	Tonnage Recovery	Iron Unit Recovery
Crude Ore and Rock Mined	1,206,505	100.00	38.19		
Less: Rock Removed in Mining,	35,688	2.96	31.05		
Crude Ore Transported to Mill,	1,170,817	97.04	38.41		
Less: Rock Rejects in Screen. Plant,	121,793	10.09	16.66		
Crude Ore Entering the Mill,	1,049,024	86.95	40.93		
Concentrates Produced: Coarse,	425,450	35.26	56.28	55.21	75.28
Fines,	153,725	12.74	54.51		
Rock Rejects on Mill Picking Belt,	5,730	.48	16.66		
Tailings (by Deduction)	464,119	38.47	22.66		
Total Heads - (as above)	1,049,024	86.95	40.93		

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1. GENERAL:

The normal winter stripping and repair program at the mine and plants started at the close of the 1946 ore season, was continued during 1947 on a 20-shift per week basis until April 17th, when stripping was completed and the mine shut down.

Repair work at the mine shops and plants, conducted on a 5 or 6 day week basis as required, continued until the start of the ore season. At the shop, the shovels, drills, electric locomotives and 30-yard dump cars were overhauled in preparation for ore service. Much repair work was done on the mill machinery, in addition to the usual running repairs on equipment used in the stripping operation.

During the shut-down, the trucks were repaired and put in good condition for the ore season.

At the washing and retreat plants, general repair of all mill machinery was conducted. New machines were installed in both plants to increase the production of retreat concentrate and improve the grade and recovery.

The pit screening plant and conveyor system were given all necessary repairs to screens, belts, chutes and hoppers.

The 1947 ore operation was begun on April 28th, on a 10-shift per week basis. Wash ore only was loaded until May 5th, when the retreat plant was put into operation and the schedule increased to 15 shifts per week. Wash and retreat ores were loaded on this schedule until July 1st, when the operating schedule was increased to 18 shifts per week and maintained thus for the balance of the season, operations being shifted from one to the other as required. A total of 1,749,112 tons of crude ore was produced, of which 167,855 tons were removed from the Delaware property of the Oliver Iron Mining Company in connection with the mining of Hill-Trumbull ore along the boundary line.

A scram crew, consisting of one shovel with two trucks, operated in the Hill lease scram area most of the ore season, cleaning out isolated pockets of low grade wash and jig ores. Much of the ore produced from this area was stockpiled because of its poor grade.

During the 1947 season, 13,129 tons of direct ore were produced from the Hill-Delaware line area.

The washing plant, operating on the same schedule as the pit, received 1,749,112 tons of crude ore, producing 83,448 tons of Hill-Trumbull and 69,482 tons of Delaware washed concentrated and 875,626 tons of washed retreat feed. The average shift production was 2,373 tons.

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1. GENERAL:
(Continued)

The retreat plant, with capacity increased, operated on feed direct from the washing plant, or was fed by tractor from the surge pile if the washing plant was producing concentrates. The plant produced 609,335 tons of Hill-Trumbull and 10,210 tons of Delaware retreat concentrates, for a shift average of 1,518 tons.

Car shortages and grading problems necessitated stocking of 114,337 tons of concentrates during the season. None of this was loaded out after the close of the 1947 season. A stockpile carry-over from 1946 of 50,681 tons was loaded in April, before the start of ore operations.

The stripping program in progress at the close of 1946 was continued until April 17th. This work was conducted along the Hill-Delaware line, uncovering Delaware ore that was to be moved under agreement with Oliver Iron Mining Company in order to make available Hill line ore tied up in slopes.

Following immediately upon the close of the 1947 ore season, a new stripping project was begun in the Southeast Trumbull area. This work involved the removal of surface and waste ore to uncover a lean jig ore.

The structure drilling program, discontinued at the close of 1946, was begun again in April on the north side of the Hill lease. Holes were put down to check the original drilling. This work was discontinued, pending completion of tests on samples, but will be resumed in an effort to outline and appraise an extension of the Hill ore body. In August, drilling was begun in the Southeast Trumbull proposed stripping area. Exploration in this area was completed in December, and the drill moved into the Trumbull pit for sample drilling.

2. PRODUCTION, SHIPMENTS & INVENTORIES:

a. Production by Grades:

Hill Crude,	95,840	tons
Trumbull Crude,	27,748	"
Hill Retreat Crude,	290,526	"
Trumbull Retreat Crude,	1,167,143	"
Total Hill-Trumbull Crude,	1,581,257	"
Delaware Crude (Oliver),	167,855	"
Grand Total Crude,	1,749,112	"
Hill Non-Bessemer Concentrates,	31,175	"
Hill Bessemer Concentrates,	24,746	"
Hill Non-Bessemer Retreat Concentrates,	76,111	"
Hill Bessemer Retreat Concentrates,	58,997	"
Trumbull Non-Bessemer Concentrates,	27,347	"
Trumbull Bessemer Concentrates,	180	"
Trumbull Non-Bessemer Retreat Concentrates,	293,309	"

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2. PRODUCTION, SHIPMENTS & INVENTORIES: (Continued)

a. Production by Grades: (Continued)

Trumbull Bessemer Retreat Concentrates, ---------	180,918	tons
Hill Non-Bessemer Direct, ----------	8,057	"
Total Hill-Trumbull Production, ----------	700,840	"
Delaware Concentrates, ----------	69,482	"
Delaware Retreat Concentrates, ----------	10,212	"
Delaware Direct, ----------	5,072	"
Total Delaware Production, ----------	84,764	"
Grand Total Production, ----------	785,604	"

b. Shipments:

Hill Non-Bessemer Concentrates, ----------	54,691	"
Hill Bessemer Concentrates, ----------	24,746	"
Hill Non Bessemer Retreat Concentrates, ---------	59,276	"
Hill Bessemer Retreat Concentrates, ----------	58,997	"
Trumbull Non-Bessemer Concentrates, ----------	31,341	"
Trumbull Bessemer Concentrates, ----------	180	"
Trumbull Non-Bessemer Retreat Concentrates, -----	204,815	"
Trumbull Bessemer Retreat Concentrates, ---------	180,918	"
Hill Non-Bessemer Direct, ----------	8,057	"
Total Hill Trumbull Shipments, ----------	623,022	"
Delaware Concentrates, ----------	69,482	"
Delaware Retreat Concentrates, ----------	10,210	"
Delaware Direct, ----------	5,072	"
Total Delaware Shipments to Oliver Iron Mining Company, ----------	84,764	"

c. Stockpile Inventories:

The season began with a stockpile balance of 36,518 tons of concentrates, 23,665 tons of which were Hill wash and 12,853 tons of Trumbull wash. The overrun resulting from the shipment of this stockpile was 14,163 tons. The season ended with a stockpile balance of 114,337 tons, made up of Hill and Trumbull wash and retreat concentrates. No Delaware ore was stockpiled.

d. Lean Material in Stock:

The following amount of lean material is now in stockpile:

Concentrating Material Above 25%

	Tons	Iron	Phos.	Silica
Hill,	55,439	29.37	.037	52.71
Trumbull,	539,106	29.50	.034	52.42
Total,	594,545	29.49	.034	52.45

Non-Concentrating Material Above 35%

	Tons	Iron	Phos.	Silica
Hill,	142,833	48.50	.081	21.90

Coarse Non-Concentrating Material Above 40%

	Tons	Iron	Phos.	Silica
Hill,	7,527	33.23	.028	43.33

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2. PRODUCTION, SHIPMENTS & INVENTORIES: (Continued)

e. Shipments by Months:

(1) Crude Ore:

MONTH	HILL WASH	HILL RETREAT	TRUMBULL WASH	TRUMBULL RETREAT	TOTAL
April,	6,884	-	11,206		18,090
May,	31,867	51,394	1,182	58,701	143,144
June,	13,117	79,950	195	183,795	277,057
July,	39,283	50,388	415	241,373	331,459
August,	3,850	30,988	14,750	268,391	317,979
September,	839	46,312	-	104,186	151,337
October,		2,726		301,359	304,085
November,		28,768		9,338	38,106
Total,	95,840	290,526	27,748	1,167,143	1,581,257

(2) Concentrates:

	HILL CONCTS.	HILL RETREAT	TRUMBULL CONCTS.	TRUMBULL RETREAT	TOTAL
April,	7,420		18,515		25,935
May,	16,686	19,820	27	23,601	60,080
June,	7,554	38,658	180	79,588	125,980
July,	22,175	18,096		97,802	138,073
August,	1,719	15,207	280	107,499	124,705
September,	367	26,260		47,787	74,414
October,		1,602	8,579	112,207	122,388
November,		15,465		5,743	21,208
Total,	55,921	135,108	27,527	474,227	692,783
Hill Direct,					8,057
Total,					700,840

f. Ore Statement:

As of December 31, 1947, there is in stockpile the following ores:

Hill Washed Concentrates,	149	tons
Trumbull Washed Concentrates,	8,859	"
Total Washed Concentrates,	9,008	"
Hill Retreat Concentrates,	16,834	"
Trumbull Retreat Concentrates,	88,495	"
Total Retreat Concentrates,	105,329	"
Grand Total,	114,337	"

HILL-TRUMBULL MINE
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2. PRODUCTION, SHIPMENTS & INVENTORIES: (Continued*

g. Delays:

The following delays were reported for the 1947 season:

Pit Delays (no crude Ore)

Hours	Minutes	Cause:
35		Moving shovel for grading
10		Power off, storms
3	30	Repairs to conveyor system
4		Repairs to pit screening plant
52	30	

Haulage Delays

7		Power failure on locomotives
5		Derailments and track repairs
6	30	Locomotive repairs
4	30	Setting out b.o. cars
23	-	

Washing Plant Delays

85	10	Screens, cleanout, patching, repairing
37	25	Belts and conveyors, repairing rips and splicing
3		Pumps, repairing, unplugging, repacking
16	40	Chutes and launders, unplugging, patching
6		Ball mill, unplugging, patching feed bowl
6	15	Pipes, unplugging, repairing
20	45	S.M.C., unplugging, repairing drags
10		Crushers, unplugging
6		Logs, unplugging, repairing
1	30	Car mover, repairing cables
7	10	Power failures, storms
13		Miscellaneous, no water, cleaning track, etc.
212	55	

Retreat Plant Delays

55	10	Screens, patching, unplugging, repairing
65	15	Conveyors, unplugging, repairing rips
73	45	Pumps, repairing, unplugging
14	30	Pipes, unplugging, repairing
11	10	Separators, repairing
57	40	Medium, raising surge and gravity
5	10	No feed, tractor repairs, etc.
12	30	Thickener, unplugging
3	30	Power failures, storms
22	45	Chutes and launders, unplugging, repairing
40	-	Miscellaneous, electric trouble, cleaning tracks, etc.
361	25	

HILL-TRUMBULL MINE
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2. PRODUCTION, SHIPMENTS & INVENTORIES: (Continued*

g. Delays: (continued)

Pit Delays:

Due to the low grade of crude ore mined, much time was lost moving shovels for grading. Several bad storms caused lengthy power failures. Repairs to screening plant and conveyor system were of a minor nature.

Haulage Delays:

Power failures on locomotives increased because of experiments conducted in an effort to increase haulage capacity through the use of three locomotives. One derailment, due to a broken axle, caused the delay in that category. Locomotive repairs included one burned-out motor and numerous broken power arms.

Washing Plant Delays:

Washing plant delays throughout the season were numerous. Screen delays were caused mostly by screens wearing out before repairs could be made. Most of the belt repairs were centered on the 36" crude ore conveyor which suffered serious damage due to rips in the top cover. With extra machinery installed this season, launders caused considerable trouble, due mainly to impossibility of getting adequate slope in them. The S.M.C. machines continued to give trouble, breaking drag chains and plugging often.

Other delays are self-explanatory.

Retreat Plant Delays:

In this plant also, the screens were a major source of trouble. Experiments will be conducted in 1948 on new screen cloth to eliminate these delays. Conveyors and pumps caused numerous delays, due to plugging, often caused by power failures. The medium circuit gave considerable trouble early in the season, but most of the difficulties were soon eliminated. Chutes and launders also caused trouble, but were redesigned.

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3. ANALYSIS:

a. Mine Analysis of Production:

	Tons	Iron	Phos.	Silica	Man.	Alu.	Moist.	Fe. Nat'l.
Hill N.B. Concs.	31,175	56.13	.046	12.78	.13	.40	8.89	51.14
Hill Bess. Concs.	24,746	56.74	.042	12.22	.14	.40	8.08	52.15
Hill N.B. Retreat Concs.	76,111	55.33	.043	14.51	.12	.35	5.24	52.43
Hill Bess. Retreat Concs.	58,997	56.46	.040	13.45	.11	.33	5.37	53.43
Trumbull N.B. Concs.	27,347	54.56	.057	14.16	.29	.38	6.51	51.01
Trumbull Bess.Concs.	180	47.10	.039	25.35	.08	.28	5.20	44.65
Trumbull N.B. Retreat Concs.	293,309	56.23	.046	12.14	.13	.40	7.54	51.99
Trumbull Bess. Retreat Concs.	180,918	56.35	.042	11.72	.13	.37	7.48	52.14
Hill N.B. Direct,	8,057	57.00	.059	11.75	.11	1.44	7.47	52.74
Total,	700,840	56.14	.045	12.51	.13	.39	7.13	52.14

b. Mine Analysis of Shipments:

Hill N.B. Concs.	54,691	56.29	.047	12.38	.13	.40	7.36	52.15
Hill Bess. Concs.	24,746	56.74	.042	12.22	.14	.40	8.08	52.15
Hill N.B. Retreat Concs.	59,276	55.66	.043	14.00	.12	.34	5.19	52.77
Hill Bess. Retreat Concs.	58,997	56.46	.040	13.45	.11	.33	5.37	53.43
Trumbull N.B. Concs.	31,341	54.31	.046	14.00	.11	.34	5.33	51.89
Trumbull Bess.Concs.	180	47.10	.039	25.35	.08	.28	5.20	44.65
Trumbull N.B. Retreat Concs.	204,815	56.49	.047	11.69	.13	.40	7.24	52.40
Trumbull Bess. Retreat Concs.	180,918	56.35	.042	11.72	.13	.37	7.48	52.14
Hill N.B. Direct,	8,057	57.00	.059	11.75	.11	1.44	7.47	52.74
Total,	623,022	56.28	.045	12.29	.13	.39	6.89	52.40

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3. ANALYSIS:
(Continued)

c. Mine Analysis of Ore in Stockpile, Dec.31,1947:

	Tons	Iron	Phos.	Sil.	Mang.	Alu.	Moist.	Fe.Nat.
Hill Wash Concs.	149	54.20	.041	18.15	.09	.46	3.90	52.08
Hill Retreat Concs.	16,834	54.15	.042	16.29	.12	.39	5.41	51.22
Trumbull Wash. Concs.	8,859	55.31	.083	12.88	.68	.44	8.76	50.47
Trumbull Retreat Concs.	88,495	55.63	.044	13.17	.13	.41	8.24	51.05
Total,	114,337	55.39	.047	13.61	.17	.41	7.86	51.04

d. Average Analysis of Crude Ore Production:

	Tons	Iron	Phos.	Silica
Hill Crude,	95,840	39.46	.036	38.38
Trumbull Crude,	27,748	35.80	.031	44.11
Total,	123,588	38.64	.035	39.67
Hill Retreat Crude,	290,526	35.14	.030	45.71
Trumbull Retreat Crude,	1,167,143	36.28	.032	42.99
Total,	1,457,669	36.05	.031	43.53

e. Complete Analysis of Season's Shipments:

	Iron	Phos.	Sil.	Mang.	Alu.	Lime	Mag.	Sul.	Loss
Hill Non-Bess. Concs.	56.29	.047	12.38	.13	.40	.28	.18	.010	5.97
Hill Bess.Concs.	56.74	.042	12.22	.14	.40	.27	.18	.010	5.90
Hill N.B. Retreat Concs.	55.66	.043	14.00	.12	.34	.27	.18	.010	5.35
Hill Bess. Retreat Concs.	56.46	.040	13.45	.11	.33	.27	.17	.011	4.79
Trumbull N.B. Concs.	54.81	.046	14.00	.11	.34	.24	.17	.011	6.61
Trumbull Bess. Concs.	47.10	.039	25.35	.08	.28	.75	.15	.011	6.41
Trumbull N.B. Retreat Concs.	56.49	.047	11.69	.13	.40	.24	.18	.011	6.42
Trumbull Bess. Retreat Concs.	56.35	.042	11.72	.13	.37	.25	.16	.010	6.64
Hill Non-Bess. Direct,	57.00	.059	11.75	.11	1.44	.28	.17	.010	4.56

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4. ESTIMATE OF ORE RESERVES:

a. Developed Ore:
Assumption:

Class of Material	Per Ton Cu. Ft.	Rock Deduction	Recovery
Merchantable 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

The above factors have been used in preparation of the following reserve estimate. They are revised somewhat from previous years and are based on latest data secured from operations and test work. Rock reductions on wash and retreat ore included in the calculation of percentage of recovery.

The following tabulation shows the estimate as of January 1,1947, the ore mined during 1947 and the ore reserve estimate as of January 1, 1948:

	Reserve 1-1-47	Mined 1947	Balance after Mining	Changed by Reestimate	Reserve 1-1-48
Trumbull Mine:					
NW-SW 17,56-23	530,592	99,665	430,927	39,343	470,270
NE-SW 17,56-23	1,229,194	402,089	827,105	45,787	872,892
Total Trumbull,	1,759,786	501,754	1,258,032	85,130	1,343,162
Hill Mine:					
SE-NW 17,56-23	117,390	148,181	-30,791	94,018	63,227
SW-NE 17,56-23	338,385	48,978	289,407	58,680	348,087
SE-NE 17,56-23	224,902	1,927	222,975	74,695	297,670
Total,	680,677	199,086	481,591	227,393	708,984
GRAND TOTAL - HILL-TRUMBULL MINE	2,440,463	700,840	1,739,623	312,523	2,052,146

The ore reserve as of January 1,1948, is the result of a new estimate on the Hill and Trumbull leases, involving re-classification of some ores, based on our latest operating data and experience in wash and retreat plants.

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4. ESTIMATE OF ORE RESERVES: (Continued)

b. Prospective Ore:

There remains, on the North side of the West Trumbull forty, an area that has possibilities of development for a low grade, jig ore. If a dragline could be used, a narrow cut might be possible in some areas along the Middle and East Trumbull forties. The stripping raio would be high, necessitating a cheap method of surface removal.

The drilling program, exploring a possible extension of the ore body on the North bank of the Hill lease, gave indication of a low grade jig ore. Experimentation on this ore, if successful, would indicate a stripping program in this area. Further drilling will be done in 1948.

c. Estimated Analysis:

Lease Grade	Tons	Iron	Phos.	Sil.	Mang.	Alu.
Hill:						
Non-Bessemer Direct,	163,943	56.36	.063	10.78	.17	.97
Bess.Wash Concentrates,	266,857	60.39	.030	10.62	.10	.47
Non-Bess.Wash Concts.	155,567	60.57	.043	11.24	.11	.44
Bessemer Retreat Concs.	42,346	56.90	.039	12.85	.11	.48
Non-Bess. Retreat Concts.	80,271	56.52	.048	13.32	.12	.48
Total Hill,	708,984	58.85	.043	11.23	.12	.58
Trumbull:						
Bess. Wash Concentrates,	214,565	59.95	.041	6.21	.15	.50
Non-Bess.Wash Concts.	343,936	58.78	.055	8.06	.11	.46
Bess.Retreat Concts.	258,304	56.10	.040	12.15	.20	.50
Non-Bess.Retreat Concts.	526,357	56.00	.060	12.10	.20	.51
Total Trumbull,	1,343,162	57.36	.052	10.13	.17	.49
Total Direct,	163,943	56.36	.063	10.78	.17	.97
Total Bess. Wash Concs.	481,422	60.19	.035	8.65	.12	.48
Total N.B.Wash Concts.	499,503	59.34	.051	9.05	.11	.45
Total Wash Concts.	980,925	59.76	.043	8.85	.11	.46
Total Bess.Retreat Concs.	300,650	56.21	.040	12.25	.19	.50
Total N.B.Retreat Concts.	606,628	56.07	.058	12.26	.19	.51
Total Retreat Concts.	907,278	56.12	.052	12.26	.19	.51
Total Bessemer,	782,072	58.66	.037	10.03	.15	.49
Total Non-Bessemer,	1,270,074	57.39	.056	10.80	.16	.55
Grand Total,	2,052,146	57.87	.049	10.51	.16	.53

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5. LABOR & WAGES:

a. Comments:

(1) Labor:

Operations at the Hill-Trumbull Mine were not affected by any labor disturbances during the year. The supply of labor, however, was inadequate, resulting in payment of much overtime. Absenteeism continued to be a major problem. Relations between the Company and the Union were good throughout the year.

(2) Wages:

Under the terms of a new Union agreement, effective in May, a general increase of $.125 per hour was granted the entire working force. All wage inequities under discussion with the Union were settled.

b. Comparative Statement of Wages and Product:

PRODUCT ----------	785,604 tons
Number of Shifts and Hours, ----------	3, 8-hr.
Average Number of Men Working, --------	190
Average Wages Per Day, ----------	$11.54
Product Per Man Per Day, ----------	24.56 tons
Labor Cost Per Ton, ----------	.471
Total Number of Days (8-hour) ---------	158
Amount Paid for Labor, ----------	$457,125.57

6. SURFACE:

a. Buildings, Repairs:

The roofs of all shop and warehouse buildings were given an asphalt coating for water-proofing. New doors were made for the truck storage shop. Other than this, only minor and necessary repairs were made to mine buildings.

c. Tracks, Roads, Transmission Lines, etc:

The usual and ordinary maintenance work was carried on through the year. Minor changes were made to transmission lines on the south side of the Trumbull lease as required by stripping operations. A cross-over track was installed in the yard to eliminate use of an empty return track from the mill, thus reducing maintenance problems.

7. OPEN PIT:

a. Stripping:

Stripping operations along the Hill-Delaware line, begun in November, 1946, were continued from the first of the year and completed April 17, 1947.

Most of the work was accomplished with one 4-1/2-yard shovel, serviced by six to eight trucks, working on a 20-shift per week schedule.

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7. OPEN PIT:
(Continued)

a. Stripping: (Continued)

This project involved removal of surface, waste ore and lean ore on Oliver Iron Mining Company's Delaware lands to make available Hill ore tied up in slopes along the line. Production was continually hampered by the nature of the job, requiring narrow cuts which slowed loading and hauling materially.

Following the close of the 1947 ore season, a new stripping program was begun in the Southeast corner of the Trumbull. This project required the removal of approximately 600,000 cubic yards of surface and waste ore overlying a retreat ore body. Two shovels were used whenever possible, serviced by ten to twelve trucks. Progress again was slowed at times by necessarily narrow cuts, and by a long haul. However, progress through November and December was satisfactory.

The following tabulation shows the stripping material removed from the various leases in 1947:

Lease	Surface Cu. Yds.	Waste Ore Cu.Yds.	Rock Cu. Yds.	Lean Ore Cu.Yds.	Total Cu. Yds.
Hill,	132,025	220,307	763	56,258	409,353
Trumbull,	299,776	65,441	-	8,550	373,767
Total,	431,801	285,748	763	64,808	783,120

g. Open Pit Mining and Loading:

The 1947 ore season was begun on April 28th, on a 10-shift per week schedule. Because of uncompleted plant work, wash ore only was loaded until May 5th, when the retreat plant was started and the operating schedule increased to 15 shifts per week. Ore production was continued on this basis, working occasional extra shifts until July 1st, when the schedule was increased to 18 shifts per week. Operations continued on this basis until November 5th, when plants were shut down and ore loading terminated. Two shovels, serviced by six or seven trucks, were used through most of the season, mixing ores from both shovels for grading purposes.

Crude ore mined totaled 1,749,112 tons, of which 252,350 tons were wash and 1,496,762 tons retreat. From this was recovered 152,930 tons of washed concentrates and 619,545 tons of retreat, for a combined concentrate production of 772,475 tons. Direct ore totaled 13,129 tons.

Wash ore was mined from both the Hill and Trumbull forties and from the Delaware lands of the Oliver Iron Mining Company under a trespass agreement with that company. Practically all of the Hill and Trumbull wash crude came from the area along the Delaware line and was mined in conjunction with the Delaware wash crude in that area. Only small amounts of wash ore were found in other

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7. OPEN PIT:
(Continued)

g. Open Pit Mining & Loading: (Continued)
areas of the Hill and Trumbull pits. Again, with the exception of a small amount of wash ore in the Southeast Trumbull area now being stripped and along the property lines, wash ore reserves in the Hill and Trumbull pits are practically exhausted. Only a relatively insignificant amount of wash will be obtained from the Hill scram operations, as the bulk of this ore remaining seems to be retreat grade.

This season's operations in the Hill scram area were disappointing in that little ore was encountered of usable grade. With the grading problem becoming more difficult in other areas of the pit, it was necessary to stock most of the ore from the scram area, as the silica in the concentrate was too high. It is hoped that continued improvements in plant metallurgy will improve this situation.

Retreat ores were mined from both the Hill and Trumbull leases, and in almost all areas of both pits. Approximately 80% of the total retreat crude was produced from the Trumbull lease. Because of grading problems, operations were conducted in all areas of the pit, except the bottom, under water, and the extreme west end. All scram ore produced was milled as retreat ore.

This season's operations removed most of the usable ore from the north bank of both leases, and indicated that only a poor retreat crude remains throughout most of the pit. Great difficulty was encountered in maintaining grade, and from all indications, this grading problem will continue. However, changes in the plants are underway in the hope of improving concentrating techniques so that a merchantable grade of concentrate can be produced from these leaner crude ores.

Plant tests, run at the close of this season's operations, indicate that finer crushing may improve the grade of concentrate and preparations are being made to change crusher installations accordingly.

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8. COST OF OPERATION:

a. Comparative Mining Costs:

		ACTUAL 1947			
	1947 BUDGET	TOTAL	LESS OLIVER DELAWARE ORE	Mesaba-CLIFFS HILL-TRUMBULL ORE	1946 ACTUAL
PRODUCT					
Direct Shipping Ore,		13,129	5,072	8,057	
Wash Concentrates,	124,000	152,930	69,482	83,448	436,022
Retreat Concentrates,	659,000	619,545	10,210	609,335	154,018
Total Production,	783,000	785,604	84,764	700,840	590,040
Average Daily Product,		5,101		4,551	6,345
Tons Per Man Per Day,		2,456		19.84	39.89
Days Operated,		154		154	93
COST:	PER TON	PER TON	PER TON	PER TON	PER TON
Open Pit Direct Ore,		$ .135			
Open Pit Crude Ore,	$ .300	.306			$ .217
General Pit Expense,	.066	.091			.043
Concentrating,	.294	.500			.253
Stocking Concentrates,	.007	.000			.006
General Mine Expense,	.126	.147			.117
Winter & Idle Expense,	.250	.257			.290
Cost of Production,	$ 1.043	$ 1.304	$ .843	$ 1.360	$ .926
Depreciation - Plant & Equipt.		.059	.059	.059	.070
Depreciation - Motorized Equipt.		.031	.031	.031	.035
Amortization - Stripping,		.301	.359	.294	.258
Taxes - Ad Valorem,		.073		.082	.115
Taxes,- Occupational,		.018		.020	.029
Taxes - Royalty,		.068		.076	.089
Total Cost at Mine,		$ 1.854	$ 1.292	$ 1.922	$ 1.522
Administrative Expense,		.089		.100	.100
Miscellaneous Expense & Income		.011		.013	.004
Grand Total		1.932	1.292	2.009	1.626
Contract Price for Mining Oliver Ore			1.444	.018	
Total Cost of Hill-Trumbull Ore				1.991	1.626

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8. COST OF OPERATION: (Continued)

d. Detailed Cost Comparison:

(1) Product:

In scheduling production for 1947, it was expected that 124,000 tons of wash ore would be produced, mostly from the trespass area, and 659,000 tons of retreat, for a total production of 783,000 tons. Although realizing that there might be some direct ore production, it was not carried in the budget because of the uncertainty over our plans in the trespass area where the direct was encountered. Slow production in the retreat plant necessitated the production of more wash concentrates than was planned. The actual production of the season was 13,129 tons of direct shipping ore, 152,930 tons of washed concentrates and 619,545 tons of retreat concentrates, for a total of 785,604 tons.

Although pit operating conditions were fair, high plant operating costs, due to numerous delays and inability to put through the expected tonnage per shift, caused a wide variance between the budget estimate and the cost obtained for 1947. A general wage increase also contributed to the cost increase.

(2) Open Pit Mining:

The cost of producing direct ore in 1947 was $0.135 and is a good cost, in view of the pit condition. This ore was obtained along the Hill-Delaware line, where the cuts were very narrow and loading conditions poor. Part of this tonnage was loaded into D. M. & I. R. Railway cars, and car shortages on this railroad delayed operations several times.

The crude ore cost per ton of concentrate as shown in the tabulation, was $.006 over the budget and $.089 over the 1946 costs. The large increase on the concentrate basis, over 1946 costs, is due to the difference in recovery, viz: 56% in 1946 and 44% in 1947.

Drilling and blasting costs were up $.002 over 1946 and $.007 over the budget. It was anticipated that less drilling would be required in 1947, but this did not prove true. Shovel operating was higher due to the necessity of running two shovels all season to maintain grade; costs here ran $.011 over 1946 and $.005 over the budget. Power shovel maintenance was up $.001 over 1946 and $.002 over the budget.

Truck operating expense was up $.005 over 1946 and $.004 over the budget, due to higher wages and the necessity of running more trucks as ore hauls increased in length. Unusually good truck service and absence of breakdowns, cut truck maintenance costs $.006 below 1946 and the budget estimate. Operation of the screening plant and conveyor was up $.003 over 1946 and $.002 over the budget.

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8. COST OF OPERATION: (Continued)

d. Detailed Cost Comparison: (continued)

(3) General Pit Expense:

Costs in this category would have been slightly under the budget were it not for an extra item, Pit Clean-up Expense, amounting to $.046.

(4) Concentrating:

Concentrating charges account for the major part of the overrun of 1947 costs over the budget estimate. Costs in this category were $.206 over the budget and $.247 over the 1946 costs. There was an increase in retreat costs of $.085 over the budget, due, in a large measure, to excessive delays and a mill capacity lower than expected, with a consequent loss in production. Heavy repair charges contributed to this increase. Washing costs increased $.026 over the budget and $.037 over 1946, due to the decreased production and increased repair charges. Power costs for pumping and mill machinery were up, due to increased use of water and installation of more machines in the plant.

Maintenance of buildings and machinery was up $.067 over the budget, due mainly to the experimental work on hydrotators and classifiers, which was thrown into this category.

(5) General Mine Expense:

Costs in this category showed an increase of $.021 over the budget and $.031 over 1946. The increase in analysis and grading, mine office expense, social security taxes and vacation expense accounted for the difference.

(6) Idle and Winter Expense:

This expense was $.007 over the budget figure and $.033 below that for 1946. This was due to slightly lower repair costs at the mill and on locomotives, cars and shovels.

9. EXPLORATIONS:

Structure drilling on the north side of the Hill pit, checking a possible ore body extension toward the Hill-Barbara pit, which was discontinued in December, 1946, was resumed in April, 1947. Six exploratory holes were drilled for a total of 738 feet. Explorations in this area were discontinued in August, and the drill moved to the proposed stripping area in the Southeast Trumbull, where 936 feet of exploratory drilling were completed by November. The drill was then moved into the Trumbull pit, where 90 feet of sample drilling were completed at the close of the year.

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10. TAXES:

The following table shows a comparative statement of taxes and average rate at the Hill-Trumbull Mine for the years 1946 and 1947:

	1947	1946	Increase	Decrease
Hill Mine,	$18,619.68	$19,675.08		$1,055.40
Trumbull Mine,	22,775.42	30,209.74		7,434.32
Hill-Trumbull Shops,	1,236.93	1,238.15		1.22
Hill-Trumbull W.P.Lands,	8,908.44	8,694.65	$213.79	
Personal Property,	6,005.21	7,816.29		1,811.08
Total,	$57,545.68	$67,633.91		$10,088.23
Village Lots,	461.21	461.69		.48
Grand Total,	$58,006.89	$68,095.60		$10,088.71
Average Tax Rate,	133.75	133.11		.64

Reduction of the Hill Mine and Trumbull Mine properties, was due to shipments made from these properties during the year.

The increase in the Hill-Trumbull Washing Plant Land was due to the general increase in the tax rate.

The decrease in Personal Property was due to no ore in stock as of May 1, 1947.

11. ACCIDENTS and PERSONAL INJURY:

There was one lost-time accident during the year, which is described as follows:

Name: John O. Hepola Date: January 30th.
Cause: Hepola was getting down off a truck, when he slipped on a small rock and bruised his right heel.
Nature: Bruised right heel.
Time Lost: Two weeks; one day.
Compensation: $28.00

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION:

The project of redesigning the retreat plant was continued from 1946 and completed for the 1947 ore season. This work involved the installation of a second heavy density unit in the heavy density plant, and installation of a ball mill in the fine ore circuit. At the close of the ore season, work was begun on construction of a second 35-foot thickener for the heavy density plant, remodelling of the rock reject bin, and installation of a Humphrey spiral unit in the fine ore circuit.

13. EQUIPMENT AND PROPOSED EQUIPMENT:

During the year 1947, the following equipment was received at the property:

1 - 6' x 16" Low-head vibrating screen
1 - Ball mill
1 - 4' x 8' Rod deck screen
1 - 12" Slurry pump
4 - 20-ton Euclid trucks
1 - 3/4-ton "International" Pick-up truck
1 - 36" Crockett magnetic separator
1 - 3" Wemco sand pump
1 - 2-ton "International" truck

19. WASHING PLANT OPERATION:

Operations at the washing plant were begun April 28th, on a 10-shift per week basis, which was increased on May 5th to a 15-shift per week schedule, until July 1st, and increased again to 18 shifts per week for the balance of the season. The washing plant shut-down on November 5th, for a total operating period of 155 days.

Operations were fairly satisfactory during the season, although breakdowns slowed production and contributed to higher costs than anticipated.

During the 1947 season, 252,350 tons of wash ore crude and 1,496,762 tons of retreat crude were treated, giving a total crude ore feed of 1,749,112 tons. Washed concentrates recovered totaled 152,930 tons; retreat feed totaled 883,899 tons, making a total wash plant concentrate production of 1,036,829 tons.

The average production was 2,373 tons per shift, or 7,119 tons per 3-shift day. The weight recovery averaged 59.3%. The increase over last season's recovery of 57.6% was due to the greater amount of retreat feed produced.

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19. WASHING PLANT OPERATION: (Continued)

Due to shortage of railroad cars and to grading problems, a total of 114,337 tons of concentrates was placed in stockpile. No stockpile was loaded out at the close of the ore season.

The complete concentrating data for 1947 is as follows:

Screening Plant Rejects

	Tons	Iron
Hill lease,	1,190	21.70
Trumbull lease,	490	17.00
Total,	1,680	20.33

36" Belt Rejects

(Picking belt not used during 1947)

	Tonnage	% of Total Mined	% Dried Iron	Tonnage Recovery	Iron Unit Recovery
Crude Ore and Rock Mined,	134,788	100.00	37.55		
Less; Rock Removed in Mining,	9,520	7.06	26.47		
Crude Ore Transported to Mill,	125,268	92.94	38.39		
Less: Rock removed in Screening plant,	1,680	1.25	20.33		
Crude Ore Entering Mill,	123,588	91.69	38.64		
Concentrates Produced,	72,373	53.69	55.97	58.56	84.82
Tailings (by deduction)	51,215	38.00	14.15		
Total Heads, as above,	123,588	91.69	38.64		

20. RETREAT PLANT OPERATIONS:

Revisions of the retreat plant flowsheet for 1947 included installation of a second heavy density unit, doubling the capacity of that plant, and the installation of a ball mill for abrasion milling in the fine ore circuit.

The retreat plant was placed in operation May 5th, on a 3-shift, 5-day basis. This schedule was increased to 3-shifts, 6 days per week July 1st and the plant ran on this basis until November 7th.

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20. RETREAT PLANT OPERATIONS: (Continued)

From a retreat feed of 875,626 tons, there was produced, 619,545 tons of retreat concentrates. The plant operated 135 days, giving an average daily production of 4,589 tons. The net weight recovery averaged 41.39%.

Breakdowns continued to cause delays and reduce production, although with revisions underway following the ore season, it is hoped that the operation of the mill will improve in 1948. Installation of the ball mill improved the grade of the fine ore concentrates.

Considerable experimentation was conducted with a full-size hydrotator unit on the -1/8 inch fraction of the ore, after grinding in the ball mill. It was found that the hydrotator would not produce a concentrate good enough to warrant installation to replace the Selective Media Classifiers. Experiments with Humphrey spiral concentrators gave much more satisfactory results and installation of these concentrators is planned for 1948.

The following is the complete Retreat Plant concentrating data for the year:

	Tonnage	% of Total Mined	% Dried Iron	Tonnage Recovery	Iron Unit Recovery
Crude Ore and Rock Mined,	333,260	100.00	36.50		
Less: Rock removed in Mining,	-	-	-		
Crude Ore Transported to Mill,	333,260	100.00	36.50		
Less: Rock Rejects in Screening Plant,	9,930	2.98	24.33		
Crude Ore Entering Mill,	323,330	97.02	36.88		
Retreat Plant Feed Produced,	219,295	65.80	50.23	67.82	92.38
Tailings (by deduction)	104,035	31.22	12.97		
Retreat Concentrates Produced,	153,613	46.09	55.86	47.51	71.96
Retreat Rejects,	18,850	5.66	22.30		
Tailings (by deduction)	46,832	14.05	43.01		

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1. GENERAL:

Operations at this property during the year 1947 were carried forward in the regular cycle of mining, concentrating and stripping, but the ore season was late in starting, due to plant and conveyor system not being in operation until July 12th.

The 1947 ore season started with the loading of Brown No. 2 concentrates from stockpile on April 11th, and this loading completed on May 22nd.

Mining and concentrating of ore got underway July 12th, on a 3-shift, 6-day a week basis, and continued on this schedule until the end of the season, on November 6th. All production was from the Brown #2 and Holman leases, and the bulk of the material from the pit bottom and, for grading purposes, from upper ore in the east end of the Brown No. 2.

Mill operations were carried forward on the same basis as the pit. Except for minor difficulties and adjustments, the newly-arranged mill, conveyor system and screening plant operated satisfactorily. Due to shortage of railroad cars, it was necessary to stockpile concentrates from time to time.

Stripping was carried forward from the 1946 season on a 20-shift a week basis, through April, at which time the schedule was changed to a 3-shift, 5-day a week basis during May and to a 3-shift, 6-day a week basis from June through to the end of the ore season. From July 12th to November 6th, stripping was carried on concurrently with ore operations as equipment was available. Practically all stripping was removed from the Brown No. 2 lease to uncover lower ore in the East end of the pit.

Exploratory drilling was carried on throughout the entire year under contract with the J. S. Schultze Company, drilling the ore body in the East end of the pit.

Repairs to equipment were carried forward throughout the year.

Construction work on E&A's MC-88 and MC-89 was carried forward in conjunction with stripping operations during winter and spring until completion.

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2. PRODUCTION, SHIPMENTS & INVENTORIES:

a. Production by Grades:

Holman Crude,	304,459	tons
Brown Crude	901,106	"
Total Crude,	1,205,565	"
Holman Non-Bessemer Concentrates,	113,605	"
Holman Bessemer Concentrates,	78,603	"
Brown Non-Bessemer Concentrates,	389,750	"
Brown Bessemer Concentrates,	186,234	"
Total Production,	768,192	"

b. Shipments:

Holman Non-Bessemer Concentrates,	113,605	"
Holman Bessemer Concentrates,	78,603	"
Brown Non-Bessemer Concentrates,	450,542	"
Brown Bessemer Concentrates,	186,234	"
Total Shipments,	828,984	"

c. Inventories:

The 113,606 tons of stockpile from 1946 were loaded out during April and May of 1947 and produced an overrun of 15,287 tons. During the current season, 52,814 tons were placed on the stockpile for 1948 shipment.

d. Lean Material in Stock:

Concentrating Material Above 25%

Lease	Tons	Iron	Phos.	Silica
Holman,	42,019	39.20	-	39.48
Brown,	121,751	32.13	.030	47.84
North Star,	20,658	26.29	.046	49.24
Bingham,	234,390	31.66	.036	49.11

Coarse Concentrating Material Above 40%

	Tons	Iron	Phos.	Silica
North Star,	585	48.89	.044	24.50

Paint Rock Above 45%

	Tons	Iron	Phos.	Silica
Bingham,	52,797	47.22	.042	25.87

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2. PRODUCTION, SHIPMENTS & INVENTORIES:

e. Production by Months:

(1) Crude Ore:

Month:	HOLMAN	BROWN	TOTAL
July,		180,598	180,598
August,	4,405	302,872	307,277
September,	105,564	202,142	307,706
October,	158,106	190,652	348,758
November,	36,384	24,842	61,226
Total,	304,459	901,106	1,205,565

(2) Concentrates & Direct Ore:

May,	-	15,287	15,287
July,		108,579	108,579
August,	3,025	194,456	197,481
September,	66,691	127,468	194,159
October,	100,962	115,506	216,468
November,	21,530	14,688	36,218
Total,	192,208	575,984	768,192

f. Ore Statement:

On January 1, 1947, there were 113,606 tons of Brown No. 2 concentrates in stock. These were loaded out in April and May, completely cleaning up all ore on stockpile grounds at old plant site. During the 1947 season, 52,814 tons were placed in stock at the new plant site, making a stockpile balance on December 31st, of 52,814 tons of Brown #2 concentrates.

g. Delays:

The following is a statement on a cumulative basis of the delays affecting ore operations during the 1947 season:

Time Lost Hours	Time Lost Minutes	Cause:
27	40	Inadequate service on empty cars
6	15	Power failure due to storms and mechanical trouble.
62	45	Adjustments and repairs to mill, conveyor system, and pit screening plant installations.
37	10	Washing plant operating delays
1	-	Pit operating delays
134	50	

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3. ANALYSIS:

a. Mine Analysis of Production:

	Tons	Iron	Phos.	Sil.	Mang.	Alu.	Moist.	Fe. Nat.
Holman N. B. Concts.	113,605	57.10	.052	11.08	.20	.40	7.76	52.67
Holman Bess. Concts.	78,603	58.24	.040	10.70	.21	.41	7.89	53.64
Brown N.B.Concs.	389,750	56.89	.049	11.87	.23	.41	7.86	52.42
Brown Bess.Concs.	186,234	57.28	.038	12.48	.19	.39	7.79	52.82
Total,	768,192	57.15	.046	11.88	.21	.41	7.83	52.68

b. Mine Analysis of Shipments:

Holman N.B.Concs.	113,605	57.10	.052	11.08	.20	.40	7.76	52.67
Holman Bess.Concs.	78,603	58.24	.040	10.70	.21	.41	7.89	53.64
Brown N.B.Concs.	450,542	56.38	.048	11.96	.50	.46	7.57	52.11
Brown Bess.Concs.	186,234	57.28	.038	12.48	.19	.39	7.79	52.82
Total,	828,984	56.86	.046	11.83	.36	.45	7.68	52.49

c. Mine Analysis of Ore in Stockpile:

Brown N.B.Concs.	52,814	56.32	.056	12.01	.17	.40	8.66	51.44

d. Average Analysis of Crude Ore Production:

	Tons	Iron	Phos.	Silica
Holman,	304,459	44.66	.039	30.60
Brown,	901,106	43.90	.038	31.94
Total,	1,205,565	44.09	.038	31.60

e. Complete Analysis of Season's Shipments:

	Iron	Phos.	Sil.	Mang.	Alu.	Lime	Mag.	Sul.	Loss
Holman N. B. Concs.	57.10	.052	11.08	.20	.40	.27	.18	.011	6.01
Holman Bess. Concts.	58.24	.040	10.70	.21	.41	.27	.17	.012	4.77
Brown N.B. Concts.	56.38	.048	11.96	.50	.46	.28	.16	.010	5.69
Brown Bess. Concts.	57.28	.038	12.48	.19	.39	.28	.16	.011	4.42

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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 Ore,	15	-	47.35
Low Grade Wash Ore,	14	-	57.86
Lean Low Grade Wash Ore,	15	-	45.10
Retreat Ore,	14	-	37.33

	Reserve 1-1-47	Mined 1947	Balance After Mining	Developed By Drilling	Reserve 1-1-48
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	2,631,126	192,208	2,438,918	-	2,438,918
Brown #1:					
SW-NE 21,56-24	575,829	-	575,829	-	575,829
Brown #2:					
SW-NW 22,56-24	3,508,998	575,984	2,933,014	-	2,933,014
Grand Total,	8,294,281	768,192	7,526,089	-	7,526,089

b. Prospective Ore:

It is not expected that the reserve tonnage for this property will change appreciably either way, although exploratory drilling will be continued to further outline the ore body.

c. Estimated Analyses of Ore Reserves:

Lease Grade	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 Concts.	529,677	58.96	.032	10.15	.17	.51
Non-Bess. Wash Concts.	629,686	57.59	.057	10.82	.28	.54
Bessemer Retreat,	131,586	58.50	.040	10.50	.16	.40
Non-Bess. Retreat,	253,932	58.00	.050	11.00	.24	.41
Total,	1,578,328	58.20	.046	10.63	.23	.56
Holman-Brown:						
Bess. Wash Conts.	1,865,924	59.24	.030	9.52	.19	.41
Non-Bess. Wash Concts.	1,366,005	57.85	.059	9.98	.15	.53
Bessemer Retreat,	817,665	58.50	.038	10.50	.16	.40
Non-Bess. Retreat,	1,898,167	58.00	.050	11.00	.16	.40
Total,	5,947,761	58.42	.044	10.23	.17	.43

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4. ESTIMATE OF ORE RESERVES: (Continued)

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

	Tons	Iron	Phos.	Sil.	Mn.	Al.
Total Direct,	33,447	57.83	.048	12.51	.30	3.47
Total Bess. Wash, Concts.	2,395,601	59.18	.030	9.66	.19	.43
Total Non-Bess. Wash. Concts.	1,995,691	57.77	.058	10.25	.16	.53
Total Wash Concts.	4,391,292	58.58	.043	9.93	.18	.48
Total Bess. Retreat, Concentrates,	949,251	58.50	.038	10.50	.16	.40
Total N.B. Retreat Concs.	2,152,099	58.00	.050	11.00	.17	.40
Total Retreat Concts.	3,101,350	58.15	.046	10.88	.17	.40
Total Bessemer,	3,347,977	58.99	.032	9.90	.18	.42
Total Non-Bessemer,	4,178,112	57.89	.054	10.65	.17	.48
Grand Total,	7,526,089	58.38	.044	10.32	.17	.45

5. LABOR & WAGES:

a. Comments:

(1) The supply of labor was ample during the year.

b. Comparative Statement of Wages & Product:

PRODUCTION

Concentrates,	768,192 tons
Direct Ore,	-
Total,	768,192 "
Number of Days Operated,	102
Average Number of Men Working,	180
Average Wages Per Day,	$ 12.46
Product Per Man Per Day,	29.81 tons
Labor Cost Per Ton,	$.298
Total Number of Days,	18,408
Amount Paid for Labor,	$307,052.24

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6. SURFACE:

a. Buildings, Repairs:

A total of $ 11,258.76 was expended during the year on 55 rented houses in Taconite. This work comprised foundation replacements and exterior painting, together with normal maintenance work.

c. Tracks, Roads, Transmission Lines, etc.

The crude ore line and plant tracks at the old plant site were removed. A new spur was constructed to the shop buildings to facilitate handling of coal for heating of mine buildings.

The road to the dump site, north of the pit, was completed and put into operation. The service road from the shops to the north side of the pit was partially built across Oliver Iron Mining Company's $NW\frac{1}{4}$-$NW\frac{1}{4}$ to replace the present road when stripping is extended to the north.

Changes in transmission lines on surface and in the pit, due to plant moving, conveyor and screening plant construction, were completed. A new line to the clear water pumps on Hill creek was also completed and put in use.

7. OPEN PIT:

a. Stripping:

Stripping operations were continued from 1946 on a 20-shift a week basis, utilizing a swing crew. This program on E&A #MC-107 entailed the moving of surface, taconite, paint rock and lean and waste ore to uncover a portion of the lower ore in the Brown No.2 lease, and a cut in surface from along the southwest corner of the Holman lease for immediate protection from the high bank, with no benches in this area. Considerable difficulty was encountered for the first part of the year on the north side of the Brown No.2 in road cut and surface cuts, due to muskeg and blue clay that was saturated with water. Water from the springs all through the formation caused trouble throughout the entire stripping program.

In May, the schedule was changed to three shifts, five days a week, and in June, to three shifts, six days a week to conform to ore operations at other properties. During July, stripping was carried on concurrently with ore operations, with available equipment. The only shovel available for stripping was one of the old 120-B's and a serious breakdown of this shovel in July caused a suspension of stripping operations during August. E&A #MC-107 was completed during July, with a realized cost of $.336 per cubic yard, as compared with a $.306 per cubic yard estimated. Increase in cost was due to difficulty encountered with haulage because of extremely wet conditions and breakdowns of overage equipment. The bulk of the material from this program was deposited on the respective dumps to the north, with some surface material placed on the dumps to the east. During operations in the lean and waste ore layers, some 56,923 cubic yards

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7. OPEN PIT:
(Continued)

a. Stripping: (continued)
of retreat ore was encountered and, with the approval of the fee owners, stocked in the pit on approved area on the north side of the Holman SE¼-NE¼.

Upon completion of repairs to the shovel, stripping was resumed in conjunction with ore on a 3-shift, 6-day basis, with available trucks in taconite area of the Brown No. 2, under E&A MC-116. This program calls for the removal of approximately 1,500,000 cubic yards, composed of 100,000 cubic yards of surface; 500,000 cubic yards of taconite; 250,000 cubic yards of paint rock and 250,000 cubic yards of lean and waste material from the Brown No. 2, together with 400,000 cubic yards of surface from the southwest corner of the Holman lease. This program will release additional lower ore in the Brown No. 2 and also the ore in the banks in the southwest corner of the Holman lease. Operations continued slow, due to the few trucks available for the long haul, together with frequant breakdowns to old 4-yard shovel. At the end of the ore season, stripping stepped up to 20 shifts per week, with a swing crew and all available equipment, but frequent and serious breakdowns to old shovels and also a burned-out motor on the newer type shovel, which put this machine out of production for three weeks, seriously hampered the operations. The springs of water which continuously flow throughout this area make haulage conditions very difficult, especially in the painty areas.

The following table shows the classes and quantities of material stripped from the several leases during the year:

Surface,	517,167	cubic	yards
Waste,	182,974	"	"
Lean Ore,	121,751	"	"
Taconite,	324,126	"	"
Save Taconite,	26,981	"	"
Total,	1,172,999	"	"

g. Open Pit Mining & Loading:
The ore season for 1947 was delayed and did not get underway until July 12th, when the new installations of pit screening plant, conveyor system, and newly-arranged concentrating plant was put in use. Operations were then carried forward on a basis of three shifts, six days per week until the end of the ore season on November 6th. A total of 1,205,565 tons of crude ore was mined and treated, yielding 768,192 tons of concentrates. Of these totals, 901,106 tons of crude was obtained from the Brown No. 2 lease and 304,459 tons from the Holman lease. These yielded, respectively, 575,984 tons and 192,208 tons of concentrates.

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7. OPEN PIT:
(Continued)

g. Open Pit Mining & Loading:

Mining was carried forward all season with two shovels, serviced by from 7 to 8 trucks, as haul required. Operations were confined, almost entirely, to the pit bottom, with a high grade ore being obtained along the south side of the pit and mixed with a higher silica ore from the east end. For grading purposes, a low phosphorus ore from the upper east end of the Brown No. 2 was mined the latter part of the season.

An average product per shift of 4,179 tons of crude ore was maintained. This was lower than expected, due to the following factors:

More rock, retreat ore, and lean ore was encountered in mining than expected. In addition to the crude ore movement, some 91,688 tons of screen rock rejects, 57,493 tons of pit rock, 33,427 tons of retreat ore and 99,589 tons of lean ore had to be moved and placed on respective dumps in the course of mining. This material, together with the 1,205,565 tons of crude ore moved, made a total of 1,488,762 tons of all material moved for a shift average of 5,122 tons for the season.

It was necessary, during the latter part of July and the first part of August, to dig a new sump some 50 feet in depth, to collect the water from the pit bottom. Severe rain storms of September 9th, together with loss of power for pumping during storms, filled the sump and the pit bottom, making difficult haulage conditions throughout the entire month of September.

The wet pit conditions not only made haulage conditions difficult, but the wet ore was difficult to handle in the pit screening plant and conveyor system.

k. Drainage:

During the winter and spring, stripping operations, it was necessary to re-lay the main discharge pipe line from the upper sumps to a position under the stripping roads along the north bank. The upper sump was cleaned with a dragline early in the summer and a new sump, 50 feet below the pit bottom, excavated and put in use in August. There was no pumping operation from the Bingham and North Star part of the pit during this year.

Water still continues to flow from springs scattered throughout the Holman and Brown ore bodies, and although the pit is being deepened, the flow of water from the upper parts of the ore body does not lessen and water table seems to remain constant as water will not seep through the formations, but has to be carried across the pit bottom, where operations are in progress, to sumps and pumped out of the pit from there.

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8. COST OF OPERATIONS:

a. Comparative Mining Costs:

	1947 BUDGET ESTIMATE	1947	1946
PRODUCT:			
Concentrates (tons)	750,000	768,192	529,070
Direct Ore "			5,433
Total	750,000	768,192	534,503
Average shift production (tons)		2,663	2,104
Tons Per Man Per Day,		29.81	28.42
Days Operated,		102	100
COST:	PER TON	PER TON	PER TON
Direct Ore,			$ .208
Open Pit Wash Ore,	$ .237	$ .292	.290
General Open Pit Expense,	.093	.100	.086
Concentrating,	.153	.108	.220
Stocking & Loading Concentrates,	.006	.002	.016
General Mine Expense,	.134	.132	.142
Winter and Idle Expense,	.200	.289	.355
Cost of Production,	$ .823	$ .923	$ 1.111
Depreciation- Plant & Equipment		.067	.071
Depreciation- Motorized Equipment,		.044	.033
Amortization of Stripping,		.309	.243
Taxes - Ad Valorem,		.150	.213
Taxes - Occupational,		.127	.019
Taxes - Royalty,		.016	.029
Amortization of Leasehold,		.192	.150
Total Cost at Mine,		$ 1.828	$ 1.869
Administrative Expense,		.100	.100
Miscellaneous Espense & Income,		.009	.005
GRAND TOTAL,		$ 1.919	$ 1.964

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8. COST OF OPERATION: (Continued)

d. Detailed Cost Comparison:

(1) Product

The average grade of the concentrates produced in 1947 was better in quality than in the previous year. A natural iron of 52.69% in 1947, compared to 51.47% in 1946. A net recovery of 63.72% as against 61.10% in 1946.

(2) Open Pit Mining:

(Direct Ore)

There was no direct ore loaded in 1947.

(Crude Ore)

The 1947 cost was $.055 higher than the budget and $.002 higher than the 1946 cost.

A comparison with the budget estimate shows items "Drilling and Blasting", "Power Shovels Operating", and "Trucks Maintenance" having only nominal differences. "Power Shovels Maintenance" was up $.016, due to considerable repair work on the old 4-yard machines. "Trucks Operating" was up $.016 as considerable work was necessary "shaking down" and adjusting new installations.

No true comparison can be made with the 1946 cost, as locomotives and cars were replaced by conveyor system in 1947.

(3) General Pit Expense:

The cost per ton under this heading was $.007 higher than the budget estimate and $.014 higher than the 1946 cost.

Compared to the budget, the differences were only nominal. The item "Stocking Lean Material" being $.014 higher, due to more of this material being encountered than expected, and "Exploratory Drilling" being $.011 lower, as less drilling was done than planned, due to shortage of equipment.

A comparison with 1946 costs show "Pumping and Drainage" $.016 higher, as a new sump was excavated in 1947 and the discharge line changed. "Stocking Lean Material" was up $.024, as none of this material was encountered in the previous year. A decrease of $.029 in the item "Exploratory Drilling" was due to rate for deferred charges per ton being less in 1947.

(4) Concentrating:

The 1947 cost under this caption was $.045 lower than the budget and $.112 lower than the 1946 costs.

Compared to the budget, all items were lower except "Maintenance Buildings and Machinery, which was $.007 higher due to general adjustments and changes on new plant layout after it was in production.

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8. COST OF OPERATION: (Continued)

d. Detailed Cost Comparison:

(4) Concentrating: (Continued)

A general saving over the 1946 costs was due mostly to a saving of $.088 in item "Transportation and Conveying", and a general lowering of costs due to new plant layout.

(5) General Mine Expense:

The cost per ton under this caption was $.002 under the 1947 budget and $.010 under the 1946 costs.

Compared to the budget, the decrease was due to an accumulation of small differences in the individual items.

The increased cost over 1946 was mainly in "Social Security Taxes", which item was $.010 higher.

(6) Idle and Winter Expense:

The 1947 cost was $.089 over the budget and $.066 under the 1946 Costs.

Compared to the budget, the increase was due, in part, to absorption of E&A #88 costs in this item and also to excessive repairs on old shovels.

9. EXPLORATIONS AND FUTURE EXPLORATIONS:

During the year 1947, the J. S. Schultze Drilling Company drilled two exploratory holes, totaling 322'-8" and eight sample holes, totaling 1,628'-1".

The exploratory drilling was all on the Brown No. 2 lease ($SW\frac{1}{4}$-$NW\frac{1}{4}$) in the northeast corner of the pit and drilled to determine the ore limits in this area.

In order to obtain further information on the lower ore body, five sample holes were drilled on the south side of the Brown No. 2 pit bottom and three holes in the central pit bottom on the Holman lease.

During 1948, it is planned to continue sample drilling in the Brown No. 2 pit bottom for information for future operations in this area.

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10. TAXES:

The following is a statement of the taxes for the years 1947 and 1946:

	1947	1946	Increase	Decrease
Holman-Brown Mine,	$81,109.80	$78,708.87	$2,400.93	
Bingham Mine,	14,354.48	15,897.86		1,543.38
North Star Mine,	7,419.11	7,080.26	338.85	
Test Laboratory & Truck Shop,	1,018.19	971.70	46.49	
New Washing Plant Site,	56.06	104.50		48.44
Auxiliary & Dump Lands,	3,059.66	2,760.68	298.98	
Holman-Cliffs Shops & Office,	376.60	367.74	8.86	
Holman-Cliffs Personal Property,	7,904.11	8,439.17		535.06
Total,	$115,298.01	$114,330.78	$ 967.23	
Rented Buildings,	1,078.50	1,076.03	2.47	
Grand Total,	$116,376.51	$115,406.81	$ 969.70	
Average Tax Rate,	124.59	118.87	5.72	

The increases in the above were largely due to the increased tax rate. The decrease in personal property was occasioned by less ore in stock as of May 1, 1947.

Shipments from the Bingham Mine accounts for the decrease in that property.

The decrease in the new washing plant site was due to removal and sale of Camp Buildings.

11. ACCIDENTS AND PERSONAL INJURY:

There were five lost-time accidents at the Holman-Cliffs Mine during the year. These are described as follows:

Name: Frank Nikich Date: January 6th.
Cause: Nikich was directing shovel operations, when the bank caved in, and wet, loose dirt was pushed back, burying him up to his knees, also, pushing him against a tractor, injuring his lower left leg. (Nikich was standing about 30 feet back of the shovel when the accident occurred).
Nature of Injury: Fractured left fibula.
Time Lost: 9 weeks - 5 days.
Compensation: $ 236.00.

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11. ACCIDENTS AND PERSONAL INJURY: (Continued)

Name: Herbert H. Lance Date: February 22nd.
Cause: Lance was backing a truck to the edge of the waste dump, when the right rear wheel got in a soft spot, causing the truck to tip over on its side. He jumped out of the truck as it was turning over, and struck his right wrist on a rock.
Nature of Injury: Severe laceration ventral surface of right wrist, flexer tendon severed; six sutures in wound.
Time Lost: 7 Weeks - 4 days.
Compensation: $ 117.34.

Name: Carl W. Paul Date: March 3rd.
Cause: While Mr. Paul was cutting and piling brush at the washing plant tailings basin, he had occasion to carry a log, and in so doing, his foot caught in a snag and in trying to retain his balance, he felt an intense pain in his side.
Nature of Injury: Right inguinal hernia.
Time Lost: 4-1/2 days.
Compensation: $ 21.50.

Name: William Hanson Date: August 27th.
Cause: While returning to the shovel with a jug of water, he stepped into a 4' or 5' post hole and injured his right leg. (Employed as shovel oiler).
Nature of Injury: Fractured fibula, right - 3" above ankle. Transverse fracture.
Time Lost: 6 Weeks - 3 days
Compensation: $ 175.50.

Name: Robert Murray Date: September 23rd.
Cause: While driving a loaded Euclid truck down an incline, he was unable to slow up speed of the truck with the brakes. He jumped from the truck and injured his right heel.
Nature of Injury: Sprained ankle and foot- X-ray for fracture- negative.
Time Lost: Two weeks - 1 day.
Compensation: $ 31.50

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION:

Continuing on from 1946, work was carried forward to completion on dismantling and moving the washing plant, construction of the crushing and screening plant in the pit, and a conveyor system from the pit to the plant, together with all auxiliary installations. Experimental fine ore plant at the old mill site was dismantled and a start made on the construction of a commercial scale plant to treat tailings from the basin during 1948. Excavations were made and foundations poured for general warehouse and truck storage building.

13. EQUIPMENT AND PROPOSED EQUIPMENT:

The following new equipment was purchased for the Holman-Cliffs Mine in 1947:

1 - Grader
1 - 27 T Drill
1 - D-8 Tractor
1 - Dragline attachment for 54-B shovel
1 - 31' Rake Classifier
2 - Dorrco Hydrosizers
1 - 35' Hydroseparator
1 - Tank for fine ore plant
2 - International service trucks
1 - Reo truck and trailer
3 - 20-ton Euclid trucks
1 - Le Tourneau Model "C" Tournadozer
1 - 1947 Ford pick-up truck
3 - International Pick-up trucks
2 - Walters trucks
1 - Browning truck crane

14. MAINTENANCE AND REPAIRS:

All washing plant machines were given necessary repairs while being moved from the old plant site to the new location. During the period from January to June, all four shovels were brought to the shop and overhauled. Repairs to the blast drills, trucks, tractors and grader were carried on throughout the year as the need arose.

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19. WASHING PLANT OPERATIONS:

The mill operated on the same schedule as the pit, treating 1,205,565 tons of crude ore, producing 768,192 tons of concentrates for a net tonnage recovery of 63.72%. The average production per shift was 2,663 tons, compared to 2,083 tons in 1946.

Although some delays were caused by stoppages for adjustments and breakdowns, the newly-arranged mill operated satisfactorily. Wet ore also gave some trouble on the scalping screen in the pit and on the belts and transfer points.

The stocking conveyor was put into operation on September 17th and, due to a shortage of Great Northern cars, it was necessary to stockpile concentrates at various times the balance of the season. A total of 52,814 tons of concentrates was placed in stock.

The tonnage and analysis of the plant rejects for 1947 were as follows:

5' x 14' Screen Rejects

Lease	Tons	Iron	Phos.	Silica
Holman,	27,042	29.18	-	52.96
Brown,	64,646	29.08		53.62
Total,	91,688	29.11		53.43

36" Belt Rejects

Belt rejects were not taken during 1947.

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

Lease	Tons	Iron
Holman,	6,094	27.29
Brown,	51,399	31.26
Total,	57,493	30.84

The following material was removed during mining operations:

Lease	Clean-up	Lean Ore	Paint Rock & Lean Ore	Waste	Surface	Total Cu.Yds.
Holman	-	24,011				24,011
Brown		32,897				32,897
Total,	-	56,908	-	-	-	56,908

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19. WASHING PLANT OPERATIONS: (Continued)

The analysis of the product from the various machines is as follows:

	Log Washer			Classifier			Tailings
	Iron	Phos.	Silica	Iron	Phos.	Silica	Iron
Holman,	57.84	-	10.25	58.18	-	11.42	21.21
Brown,	57.03	-	11.32	56.96	-	12.47	21.06

The concentration data for the Holman-Cliffs Mine for the year 1947 was as follows:

	Tonnage	Percentage of Total Mined	Percent-Iron Dried	Tonnage Recovery	Iron Unit Recovery
Crude Ore and Rock Mined,	1,354,746	100.00	42.51		
Less: Rock removed in mining	57,493	4.24	30.84		
Crude Ore transported to mill	1,297,253	95.76	43.03		
Less Rock rejects in screening plant	91,688	6.77	29.11		
Crude ore entering mill,	1,205,565	88.99	44.09		
Concentrate produced,	768,192	56.70	57.16	63.72	82.61
Rock rejects mill picking belt,	-	-	-		
Tailings (by deduction)	437,373	32.29	21.13		
Total heads, as above,	1,205,565	88.99	44.09		

19. WASHING PLANT OPERATIONS: (Continued)

The analysis of the product from the various machines is as follows:

	Log Washer			Classifier		Tailings
	Iron	Phos.	Silica	Iron	Phos.	Silica	Iron
Holman,	57.84	-	10.05	58.18	-	11.42	21.21
Brown,	57.03	-	11.32	56.96	-	12.47	21.06

The concentration data for the Holman-Cliffs Mine for the year 1947 was as follows:

	Tonnage	Percentage of Total Mined	Percent-Iron Dried	Tonnage Recovery	Iron Unit Recovery
Crude Ore and Rock Mined,	1,354,746	100.00	42.51		
Less: Rock removed in mining	57,493	4.24	30.84		
Crude Ore transported to mill	1,297,252	95.76	43.03		
Less Rock rejects in screening plant	81,688	6.77	29.11		
Crude ore entering mill,	1,205,565	88.99	44.09		
Concentrate produced,	768,192	56.70	57.16	63.72	82.61
Rock rejects mill picking belt,	-	-	-		
Tailings (by deduction)	437,373	32.29	21.13		
Total Heads as above,	1,205,565	88.99	44.09		

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1. GENERAL:

Mining during 1947 was far from normal in many respects. When the operation of the Sargent Mine was taken over from International Harvester Company on Sunday, March 2nd, it was found that, during the thirteen-month strike, no regular underground repair program had been carried on from fear of Union reprisals; only props put in by the shift bosses. In the many miles of main-level and sub-level drifts, through a shallow orebody spread over three forties, numerous places were down and several bad sand runs immediately under the old milling pit.

With exceptional dispatch, a very fair offer was made to the Union, which they accepted on March 5th. The Union responded with no labor troubles and very good production throughout the year. A six-day per week schedule was maintained throughout the year. Contracts of two miners each were started as fast as repairs could be made; four places single shift of 8 hours by the end of March and nine on May 1st. On May 12th, double shift was started, six contracts with two 8-hour shifts per day, and gradually increased, as miners became available, to eleven contracts at the end of the year.

The remaining ore lies in a shallow, north east and south west, trough across the $SE\frac{1}{4}$ of $SE\frac{1}{4}$, the $SW\frac{1}{4}$ of $SE\frac{1}{4}$, of Section 23, and the $NW\frac{1}{4}$ of the $NE\frac{1}{4}$ of Section 26 and a parallel secondary trough roughly 500 feet north, which is exhausted in the center of the property. The property to the east is stripped and there is an old milling pit nearly exhausted near the west line. Mining operations during 1947 were carried on near the east and west ends of all three forties. The main shaft has two hoisting compartments, one ladder-way and one pipe compartment. Timber is dropped through two timber shafts. Ore tramming is done on the main level at a depth of 215 feet.

Necessary underground drift repair was extensive, delayed the start of slicing, took sixteen miners in March and kept from four to eight men on repair throughout the rest of the year. Two sand runs from spring thaws in the pit and again in August and September, caused extra repair. The heavy rain and electric storm September 9th, with power off for seven hours, nearly flooded the mine, but was controlled.

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2. PRODUCTION, SHIPMENTS & INVENTORIES:

a. Production:
Sargent, ---------- 147,411 tons

b. Shipments:
Sargent, ---------- 91,482 "

c. Stockpile Inventories:
Sargent, ---------- 55,929 "

d. Production by months:

Month	Tons
March	711
April	8,126
May	12,449
June	14,101
July	15,878
August	16,673
September	16,150
October	21,032
November	19,965
December	22,326
Total,	147,411

f. Ore Statement:
Regular production from the shaft onto the stockpile continued after the close of the shipping season, bringing the production figures for the year to 147,411 tons and the stockpile balance to 55,929 tons.

g. Delays:
September 9th, 8 hours - electrical storm - Power Company line down
September 10th, 8 hours - repairing storm damage
December 16th, 4 hours - hoist transformer

3. ANALYSIS:

a. Production:

	Tons	Iron	Phos.	Silica	Mang.	Alu.	Moist.	Fe. Nat.
Sargent	147,411	56.54	.062	10.18	.88	2.07	14.09	48.57

b. Shipments:

Sargent	91,482	56.33	.062	10.32	.91	2.00	14.01	48.44

c. Mine Analyses of Ore in Stockpile:

	55,929	56.86	.061	9.99	.83	2.19	14.23	48.77

d. Complete Analysis of Shipments:

Iron	Phos.	Silica	Mang.	Alu.	Lime	Mag.	Sul.	Loss
56.33	.062	10.32	.91	2.00	.32	.20	.011	5.16

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4. ESTIMATE OF ORE RESERVES:

a. Factors:

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

b. Ore Reserves:

	RESERVE 1-1-47	MINED 1947	RESERVE 1-1-48
$SE\frac{1}{4}$-$SE\frac{1}{4}$ Sec. 23, 57-22	568,049	91,542	476,507
$SW\frac{1}{4}$-$SE\frac{1}{4}$ Sec. 23, 57-22	751,013	55,869	695,144
$NW\frac{1}{4}$-$NE\frac{1}{4}$ Sec. 26, 57-22	228,502	-	228,502
Total Main Ore Body,	1,547,564	147,411	1,400,153
$NE\frac{1}{4}$-$NE\frac{1}{4}$ Sec. 23, 57-22	317,772	-	317,772
$NW\frac{1}{4}$-$SE\frac{1}{4}$ Sec. 23, 57-22	99,715	-	99,715
Total Isolated Ore,	417,487	-	417,487
Grand Total,	1,965,051	147,411	1,817,640

c. Analysis of Ore Reserves:

Tons	Iron	Phos.	Silica	Mang.	Alu.
1,817,640	56.89	.068	10.01	.84	2.27

5. LABOR & WAGES:

a. Comments:

There was a shortage of experienced miners throughout the year. During the strike, all the Sargent miners were working at other mines but, after much urging, practically all returned. Training of student miners produced a few good men, but it continues difficult to get young men to go underground when open pit work is available. There was a general wage increase of 12-1/2¢ per hour, effective April 1st.

b. Statement of Wages and Product:

PRODUCT	147,411 tons
Number Shifts,	438
AVG. NO. OF MEN WORKING:	
Surface,	13-1/2
Underground,	52
Total,	65-1/2
AVG. WAGES PER DAY:	
Surface,	10.456
Underground,	12.392
Total,	11.704
PRODUCT PER MAN PER DAY:	
Surface,	29.79
Underground,	14.52
Total,	8.27

SARGENT MINE
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5. LABOR & WAGES:
(Continued)

b. Statement of Wages & Product: (Cont'd):

LABOR COST PER TON:	
Surface,	.382
Underground,	1.072
Total,	1.454
TOTAL NUMBER OF DAYS:	
Surface,	247
Underground,	247
Total,	247
AMOUNT PAID FOR LABOR:	
Surface,	$35,160.11
Underground,	159,482.50
Total,	$194,642.61

The mine was operated:
6 days per week, single shift, March 24th to May 10th.
6 days per week, double shift, May 12th to Dec. 31st.

6. SURFACE:

a. Buildings, Repairs:
No building repairs of any consequence were made during the year.

b. Stockpiles:
The Harvester stockpile of 78,702 tons was loaded and the grounds carefully cleaned up by May 7th. Frost conditions were very bad and the work hazardous with a one-yard shovel. After two bad slides, a rented 2-yard shovel finished the loading.

There were 55,929 tons in stockpile as of December 31,1947.

The stockpile grounds were enlarged. Strips along both sides were graded with a bulldozer and covered with a layer of lean ore.

New legs and sills were put in the trestle to the rock dump.

c. Tracks, Roads, etc:
No track or road repair was done during the year.

7. UNDERGROUND:

a. Shaft Sinking:
None.

b. Development:
No extensive development was necessary; only a few drifts to open blocks of ore for slicing.

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7. UNDERGROUND:
(Continued)

c. Stoping:

The mining method is regular top slicing. Sub-level interval is 14 feet and normal post length is 12 feet, but varies from 14 feet to 5 feet. Fifteen horse-power slusher hoists are used in slices and short pulls to main-level raises. Only two contracts had hand tramming and with the delivery of new 20 H.P. slusher hoists, which are more efficient on a long pull, hand trams and building of slides were eliminated.

d. Timber:

Acquiring satisfactory mining timber on March 1st presented quite a problem, because the highways are closed to heavy loads from March 20th to June 1st. All the jackpile that local dealers could furnish was immediately purchased. The timber in the Harvester inventory had been cut one year or more, but it was necessary to use it. After June 1st, new jackpine timber was available and tamarack in the late fall.

Statement of Timber Used:

	Lineal Feet	Amount 1947
7" to 9" Jackpine post timber	174,812'	$ 9,424.97
9" to 11" jackpine cap timber	36,256'	5,985.69
Total Slicing Timber,	211,068'	$15,410.66
7" to 9" Tamarack sub-level timber	13,234'	$ 1,818.26
9" to 11" Tamarack Main-Level Timber	7,145'	1,486.53
Total,	20,379	$ 3,304.79
5" Tamarack Poles,	114,648'	$ 5,060.25
3" " "	269,832'	7,418.26
5/8" Mining boards (M)	198,937'	8,544.53
Mine Fencing Wire (Rolls)	139	1,567.80
6' Lagging (Cords)	117½	1,776.25
Product, ----------		147,411
Ft. Slicing Timber Per Ton of Ore, ----------		1.432
Cost Per Ton For Timber, Lagging, Poles, Boards, and Wire, ----------		.292

e. Mining and Loading:

The 15 H.P. slusher hoists, which had been left in the mine during the strike and run occasionally developed electrical trouble. Delivery of repair parts and new hoists was slow. Old 7 H.P. hoists and three second hand 15 H.P. hoists were used until delivery of new 20 H.P. hoists late in the summer. Jackhammer machines were all old and new ones purchased monthly.

f. Ventilation:

Natural ventilation through the main shaft, timber shafts, and raises to pit is not quite sufficient, so that small fans, up to 5 H.P., are used throughout the mine.

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8. COST OF OPERATION:

a. Comparative Mining Costs:

	BUDGET ESTIMATE	COST 1947 MAR. 1ST-DEC. 31ST.
PRODUCT:	123,000	147,411
Average Daily Product,		597
Tons Per Man Per Day,		8.27
Days Operation,		247
COST:		
Total Cost at Mine:		
Underground Costs,	$ 1.640	$ 1.771
Surface Costs,	.161	.184
General Mine Expense,	.253	.257
Cost of Production,	$ 2.054	$ 2.212
Loading and Shipping:		
Power Shovel,		.005
Pocket,	.030	.020
Total Loading & Shipping,	.030	.025
Purchase of Plant & Equipment,		.060
Taxes - Ad Valorem		.285
Taxes - Royalty		.034
Administrative Expense		.054
Miscellaneous Income & Expense		
Grand Total		$ 2.670

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10. TAXES:

a. Statement of Taxes:

Sargent Mine, ----------	$ 41,227.99
Auxiliary Lands, ----------	43.37
Personal Property, ----------	678.51
Total Sargent Mine Taxes, ----------	$ 41,949.87

11. ACCIDENTS AND PERSONAL INJURY:

There were two lost time accidents at the Sargent Mine during the year 1947. These are described as follows:

Name: John D. Hill Date - April 23rd.
Cause: The stockpile at this mine was being loaded out and Matt Lahti and John Hill were employed as blaster and helper, respectively, to blast down the crest of the ore pile, which was frozen to a depth of 6-7 feet and causing considerable difficulty in loading operations, as well as the hazardous working conditions created by the overhang of the frozen material.

The pile at the point of the accident was approximately 30-35 feet high and the men were 8-9 feet behind the crest, driving 3-4-foot blast holes with a maul and hammer, preparatory to blasting down the crest.

The men had drilled two of the planned four holes and had loaded one hole, when suddenly a section 16-20 feet long, 8-9 feet wide and 6-8 feet thick, broke away behind them and they came down with the section.

They fortunately rode the top of the section down and Lahti sustained a fracture of the 11th right rib and a bruise of the upper part of the right thigh. Hill, unfortunately, had his left leg caught among some broken pieces and sustained three fractures of the left leg and a long cut (8") of the right leg, requiring about 15 minutes to release him.

Time Lost: 25 weeks - 1 day.
Compensation: $ 604.00

Name: Matt Lahti Date - April 23rd.
Cause: Same as noted above for John D. Hill.
Nature of Injury: Fracture of 11th right rib; bruise upper part of right thigh.
Time Lost: 8 weeks - 5 days
Compensation: $ 212.00

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13. EQUIPMENT AND PROPOSED EQUIPMENT:

New equipment received during 1947 consisted of eleven Ingersoll-Rand RB-12 Jackhammers, one 5 H.P. and one 3 H.P. Fan, one battery for 1-1/2-ton Goodman Battery Locomotive, one Sullivan and six Ingersoll-Rand 20 H.P. slusher hoists. Second-hand equipment consisted of three 15 H.P. slusher hoists, and one 5 H.P. Fan.

Increasing the number and horsepower of slusher hoists has overloaded the rotary converter set, slowing down slushing, fans, and main-level tramming, all operating on D.C. current. A second rotary was installed in December.

16. PUMPING:

Mine drainage is handled by one of two plunger pumps on the main-level; normal flow, 350 gallons per minute against a 215-foot head to surface. A 1,000-gallon centrifugal takes care of storm floods through the milling pit.

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11. ACCIDENTS AND PERSONAL INJURY

a. Fatal Accidents

After almost 23 months without a fatal accident at all the company properties, a series of fatal accidents began to occur. During the year of 1945 we had one fatal accident on March 26th. During 1946 we had no fatal injuries and very few serious injuries. Starting on February 19, 1947 and through October 31, 1947 there were seven fatal injuries which occurred in four of the underground properties. Two of these accidents were from falls of ground, one being the type which cannot be foreseen, the other occurred when the miner failed to heed the warnings of his three partners who had already stepped to safety and were calling to the miner to get to safety.

Two other injuries were caused by haulage trains underground. The one was plain negligence on the part of a group of men when they pushed an empty timber truck on a switch and left it protruding onto the main haulage track and the haulage train struck it. In the other case, a miner was struck by the lead car of a haulage train when he failed to hear warnings shouted to him by his partner and a brakeman.

One man was fatally injured while moving a scraper hoist, one when a chunk of ore fell down an open raise and one man fell down a shaft when an old stage gave away.

Brief accounts of each fatal injury follows:

Roy A. Wendt, a miner, was fatally injured in a haulage accident in the Mather Mine at 8:30 A.M., February 19, 1947. Wendt and his partner were to send up supplies in 2010 Raise on the 2nd level. 2010 Raise is located on a short switch along the main haulage track and is a supply raise for a number of contracts above the 2nd level. An empty timber truck had been left under the raise by the previous shift and this truck was moved down the track close to the main haulage track by Wendt and his partner. Because the men who were to hoist the supplies on the sub-level had not yet reached the sub-level, Wendt and his partner sat on a bench near the switch to await a signal from the other men when they would be ready to hoist. Three C/A men also arrived at this point at this time and also sat down on the bench. A haulage train loaded with ore came from inside at about this time and one of the C/A men stepped in front of the truck to signal the motorman to slow down as he wanted some supplies from the shaft and was going to leave the order with the motorman. The motorman did shut off his power and allowed the train to coast. As the first car (granby type) reached the switch, the dumping wheel of the car struck the timber truck which in turn derailed and struck Wendt. The truck passed over Wendt's body causing death instantly. The motorman had reversed the motor but could not stop in time to prevent the accident.

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11. ACCIDENTS AND PERSONAL INJURY

a. Fatal Accidents (Continued)

William F. Racine, scraper operator - Cliffs Shaft Mine, was fatally injured at approximately 3:30 A.M., April 26, 1947 when struck by a piece of ore which fell down an ore pass to the stope below where Racine was working.

Racine and two other men had been scraping ore from a small stope fed by an ore pass into haulage cars on the 10th level. When a deep trench had been dug out by the scraper after loading a number of cars, the men decided to move the scraper block. While doing so, a chunk of ore became dislodged in the ore pass. The men heard the chunk falling and started to run for safety. The piece of ore hit Racine at the base of the skull as he stumbled and fell on the coarse, chunky ore.

Angelo L. Tasson, a timberman, was instantly killed in a fall down "B" Shaft of the Cliffs Shaft Mine at 5:00 A.M., May 9, 1947.

Tasson and two other men were to remove a platform below the 10th level and install a loading chair at this location. No loading had been done at this point for over 12 years. After cleaning up about five tons of ore from the platform, Tasson and one of the other men were removing the double-thickness, three-inch planks from the platform when two of the planks fell out from under Tasson plunging him down the shaft 215 feet to another platform above the 15th level.

On June 8, 1947 at 1:15 A.M., August E. Tyynismaa was fatally injured by a fall of ground on the -25 sub-level in the Cambria-Jackson Mine. Tyynismaa and three other men were repairing on the sub-level near 731 Raise. The sub-level had been repaired from both directions leaving only about five feet of drift to repair. There were new timber sets on both sides. Because the distance was short between the new sets, and fore-poles could not be used, the men decided to pull wood-blocking from the back on one side and then put in tamarack poles between the new sets to support the back and give the men protection while the rest of the work was completed. Part of the back had been taken out and three tamarack poles had been put in the back when there was a dribble of ore from one side in the back. Three of the men stepped under the new timber but Tyynismaa stayed in the place. The three men called to him to come out but he still stayed. The next moment one of the old timber legs behind Tyynismaa struck him and knocked him down. He was pinned to the floor of the drift by a run of ore from the back which covered his chest. The burden on him could not be removed soon enough to save him. He died from a crushed chest and fracture of the skull.

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11. ACCIDENTS AND PERSONAL INJURY

a. Fatal Accidents (Continued)

A fall of ground caused instant death to Otto Backa, miner-Cliffs Shaft Mine at 12:45 P.M., June 27, 1947.

Backa worked in 72 contract - 2nd level, "B" Shaft and was a very good miner. On June 26th he had drilled and blasted floor in his stope. The blast had been fired between the wall of the stope and a pillar. The ore is very hard at this mine. The morning of June 27th Backa started to trim loose pieces of ore from the pillar and finally worked around half of the pillar. Before lunch he had told his partner and the shift boss that the pillar seemed to be in good condition but he had more small pieces to trim. He sounded the ground and said it was good. After lunch he resumed his trimming when all of a sudden a great mass of large chunks of ore fell from the side of the pillar striking and covering Backa. The chunks of ore were too large to sound and test properly and gave no warning.

While moving a scraper hoist in Number 22 contract, 00' sublevel above the 6th level at the Maas Mine, Oliver R. Hill was fatally injured. The accident happened at 9:45 P.M., October 16, 1947.

Hill and his partner were completing the mining of the sublevel and when starting work on October 16th they scraped some ore into the raise after which Hill's partner started to drill a round of blast holes and Hill decided to line-up the scraper hoist with the new slice. He first used the compressed-air operated utility hoist to move the scraper hoist from its old position to the new position. The scraper hoist needed only to be pulled forward a few inches so Hill decided to move the hoist by its own power. He took the steel cable of the hoist, threaded it through a block hung directly ahead of the hoist on the second set of timbers of the new slice and anchored the end of the cable to an angle iron which lay over a hole in foot side of the ore compartment of the raise. The end of this angle iron was buried under the covering poles and some ore, but the other end was free on top of the grizzlies. When Hill applied power to the hoist the free end of the angle iron moved upwards and engaged the steel skid of the scraper hoist causing it to tip over. Hill was struck in the temple by the control handle of the hoist while leaning over the hoist.

In a haulage accident at the Maas Mine on October 31, 1947 at 4:15 P.M., Sam Jacobson, a miner, was struck by the lead car of a haulage train. The blow caused a basal fracture from which he died before he was taken to surface about ten minutes later.

When Jacobson and his partner came on shift they arrived underground at 3:40 P.M. and walked inside to 5327 Raise on the 5th level in which raise these two miners were scraping their ore. Both men

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Safety Department

Annual Report

Year 1947

11. ACCIDENTS AND PERSONAL INJURY

a. Fatal Accidents (Continued)

sat on a bench before starting up the raise. In the meantime, the haulage crew which hauled ore from this cross-cut had come inside to where their haulage train had been left by the previous shift. The train was at 5300 cross-cut and two of the ten cars of the train were loaded. The brakeman who had the tail lamp with him went to the last car of the train and hung the electric tail-lamp on its proper bracket. Because of the time (4:00 P.M.) and not seeing anyone in the drift, he gave the signal to the motorman to push the cars back into the cross-cut and the brakeman walked ahead of the train to warn anyone who might be in the drift of the approaching train. On the way inside he warned three men of the approaching train and on reaching 5325 Raise he called to the two miners sitting between 5326 and 5327 Raise of the train approaching and then stopped at 5325 Raise where he intended to load ore. Jacobson's partner got up, warned Jacobson of the approaching train and then started to climb 5327 Raise. Jacobson had gotten up from the bench and was fastening his dinner bucket to the bib of his overalls when the lead car struck him. He was knocked down along the side of the car and his injuries were probably caused from a squeeze between the car and a mud-box located under the chute. The train travelled hardly one car-length (11 feet) before it was stopped by the motorman.