PELLETIZING PLANT
ANNUAL REPORT
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TABLE 21. Materials Preparation

Balling Section - Monthly Operating Data

	Tonnage* Processed	Total Hours Operation	Net Operating Hours A Disc	B Disc	C Disc	D Disc
September	12,582	804.2	344.9	157.4	129.4	172.5
October	15,346	985.8	412.3	324.3	123.7	125.5
November	19,280	1,026.1	402.5	363.3	221.5	38.8
December	19,194	940.2	358.8	312.6	212.0	56.8
Sub Total	66,402	3,756.3	1,518.5	1,157.6	686.6	393.6
Start up Period**	7,780					
Total	74,182					

*1.059 x L.T. used to compensate for filter cake moisture and additives.

	Per cent Operating Hours - Net Time Basis A Disc	B Disc	C Disc	D Disc	Avg. No. Discs Operating Net Time Basis	Avg. Balling Rate - LTPH Each Disc	Feed to Grate
September	100.0	45.7	37.5	50.0	2.33	15.7	36.5
October	100.0	78.7	30.0	30.5	2.39	15.6	37.3
November	100.0	90.2	55.0	9.7	2.55	18.8	47.8
December	100.0	87.2	59.1	15.8	2.62	20.4	53.5
Yearly Average	100.0	76.2	45.3	25.9	2.47	17.7	43.7

**operating time not recorded.

PELLETIZING PLANT
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TABLE 22. Pellet Firing

Monthly Operating Table

	Tonnage Processed	Pellets Produced	Total Hours Operating	Delays	Per Cent Operation	Pelletizing Rate: Long Tons per Hour Gross Time Basis	Pelletizing Rate: Long Tons per Hour Net Time Basis	Pelletizing Rate: Long Tons/Sq. Ft. - Day Over Firing** Zone	Pelletizing Rate: Long Tons/Sq. Ft. - Day Over** Up Draft
September	12,582*	9,542	456	143.8	68.5	20.9	30.6	1.46	0.89
October	15,346*	12,342	552	149.0	73.9	22.4	30.2	1.44	0.88
November	19,280	14,465	480	83.0	82.7	30.1	36.4	1.73	1.06
December	19,194	14,592	440	98.0	77.8	33.2	42.7	2.03	1.24
Sub Total	66,402	50,941	1,928	468.8	75.7	26.4	34.9	1.66	1.01
Start up Period	7,780	4,816	448	233.5	47.9	10.7	22.4	1.07	0.65
Total	74,182	55,757	2,376	702.3	70.6	23.5	33.3	1.59	0.97

*does not include returns.
**net time basis.

Chemical Analysis+

	Weight Recovery	% Fe.	% Silica	% S.	% P.	Fuel Consumption MBTU/LT
September	83.4	63.68	7.85	0.010	0.031	2.48
October	88.4	62.92	9.16	0.008	0.040	2.94
November	82.5	63.05	7.94	0.007	0.028	3.26
December	83.6	64.11	7.03	0.005	0.044	2.76
Average	84.3					2.89
Start up Period	68.1					3.00
Yearly Average	82.6	63.48	7.91	0.007	0.036	2.90

+chemical analysis of start up production included in September figures.

PELIETIZING PLANT
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TABLE 22. Pellet Firing (Cont'd.)

Monthly Operating Table

Size Analysis - Per cent

Mesh Size	September %	September Cum. %	October %	October Cum. %	November %	November Cum. %	December %	December Cum. %	Yearly Avg. %	Yearly Avg. Cum. %
2"	6.7	6.7	9.8	9.8	4.3	4.3	3.2	3.2	5.7	5.7
1	15.8	22.5	14.2	24.0	8.4	12.7	7.4	10.6	10.8	16.5
¾	9.1	31.6	12.4	36.4	4.4	17.1	4.9	15.5	7.3	23.8
½	17.0	48.6	18.6	55.0	14.6	31.7	13.5	29.0	15.3	39.1
3/8	25.7	74.3	19.4	74.4	22.5	54.2	24.5	53.5	22.2	61.3
3M	17.0	91.3	11.1	85.5	22.3	76.5	23.0	76.5	16.6	77.9
4	2.6	93.9	1.8	87.3	3.0	79.5	5.0	81.5	3.1	81.0
6	1.1	95.0	1.0	88.3	1.2	80.7	1.8	83.3	1.2	82.2
-6	5.0	100.0	11.7	100.0						
Total	100.0		100.0							
8M					0.7	81.4	1.0	84.3	0.8	83.0
10					0.6	82.0	0.7	85.0	0.6	83.6
14					0.5	82.5	0.6	85.6	0.5	84.1
20					0.5	83.0	0.5	86.1	0.5	84.6
28					0.5	83.5	0.4	86.5	0.5	85.1
-28					16.5	100.0	13.5	100.0	14.9	100.0
Total					100.0		100.0		100.0	

SPIES-VIRGIL MINE
ANNUAL REPORT
YEAR - 1956

Because of the termination of mining operations at the Spies Mine on June 2, 1955, there was no production for 1956.

The first ore shipped from the Spies Virgil Mine was 314 tons of development ore in 1916. The total life production from the Spies-Virgil property was 4,060,630 tons.

For tax purposes, a stockpile figure of 23,732 tons of ore was shown on hand as of January 1, 1956. A total of 32,893 tons of ore was shipped by July 1, 1956 to clean out all of the remaining stockpile ore at the Spies Mine. This would indicate an overrun of 9,161 tons. However, the entire 32,893 tons plus 11,820 tons of overrun from the preceding year was the total overrun which had been accumulated at the Spies Mine in 1953, 1954, and 1955. This accumulation of 44,713 tons had occurred because the last time both of the Spies stockpiles had been entirely cleaned out was in 1952.

The Caspian Construction Company was again contracted to load out the remaining stockpile ore for $.07 per ton. Additional equipment was hired from them for scraping up the last few trains of ore that the shovel operation couldn't manage alone.

Two men were retained on the Spies payroll to do the sampling and send loading reports to Ishpeming.

When the stockpile loading operations were completed, these two men were used on various clean-up, dismantling, and repair jobs. All the old buildings were dismantled and anything salvable was trucked up to Ishpeming. They helped and supervised the dismantling of the idler stands and the headframe. They also erected and repaired fences around the caved area and the old shafts.

Due to a prior agreement with the Andreski farm occupants, it was necessary for The Cleveland-Cliffs Iron Company to run a new water line from the Spies Location to the farm. This terminated the Company's liability to supply water to the Andreski's. It, therefore, eliminated the necessity to maintain a water line into the Spies property.

This brief annual report will write the close of the Spies Mine. All the stockpiles are shipped; the shafts are all capped with concrete reinforced with steel rails and are fenced; all the usable equipment is shipped to Ishpeming operations; the headframe and idler stands are scrapped; and the buildings are all dismantled.

AGNEW MINE

ANNUAL REPORT

YEAR 1956

1. GENERAL

Operations continued on a 2-shift, 5-day-per-week schedule until February 28. From this date on, it would have been very costly to continue mining to exhaust the small tonnage of developed ore. Fixed overhead such as mine office, supervision, hoistmen, pumpmen, skiptenders, motormen, power, etc., would have been impossible to reduce in the same proportion as the reduction in tonnage produced. Further, it would have been practically impossible to divide the small drift pillar in the Alworth and the narrow channel in the lower Agnew into smaller areas so that more than four gangs could be kept working and producing ore. Even if it were possible to cut up the drift pillar and the narrow channel into more working places, the safety hazards involved in working too many men in a small area would have been too risky. Consequently, with the reduction of production gangs from seven to four, production was terminated on February 28 and salvage operations begun.

Removal of conveyor equipment, locomotives, cars, tuggers, pumps, rail, pipe, etc., from the underground was completed during March. Crews were then transferred to other mines. A major part of the underground equipment was either sold, transferred, scrapped, or stored at the Central Warehouse. Some items, such as the ore and cage hoists, pumps, motors, and lockers, were left on the property. All the buildings, headframe, and trestle have been left intact. A temporary cover of rail has been placed over the shaft opening; however, other arrangements will probably have to be made to provide a more permanent cover for the shaft opening if and when the property is completely abandoned and the lease given up.

Stockpile loading of Agnew-Alworth stockpile began on April 13 and was completed on April 25. 33,317 tons of Agnew ore and 6,534 tons of Alworth ore were loaded out of stockpile by the Haley-Young Mining Company, and car spotting service was obtained from the Great Northern Railway Company.

The M. A. Hanna Company produced and shipped 10,945 tons of ore under the Agnew-South Agnew cross mining agreement.

2. PRODUCTION-SHIPMENTS-INVENTORIES

a. Production

Crude Ore		13,386
Concentrates		
Agnew-South Agnew		10,368
Direct Ore		
Agnew Shaft	21,649	
Agnew-South Agnew	577	22,226

b. Shipments

Agnew Shaft	33,317
Agnew-South Agnew Direct*	577
Agnew-South Agnew Concentrates*	10,368
	44,262

*Ore Mined by M. A. Hanna

c. Inventory

None

d. Production by Months

September	4,039
October	9,347
	13,386

d. Production by Months - Concentrates

Month	Shaft	Direct	Concentrates	Total
January	8,517			8,517
February	8,657			8,657
April	4,475			4,475
September			3,051	3,051
October		577	7,317	7,894
	21,649	577	10,368	32,594

3. ANALYSIS

a. Tonnage & Analysis of Ore Produced & Shipped

	Tons	Iron	Phos	Silica	Mang	Alum	Lime	Mag	Sulf	Ign Loss	Moist
Agnew											
Non Bess Shaft	33,317	54.18	.058	12.37	.80	1.52	.12	.12	.009	7.11	13.42
Agnew-South Agnew											
Direct	577	50.63	.059	16.43	.72	3.11	.07	.07	.009	6.75	16.60
Concentrates	10,368	54.61	.070	10.22	.94	2.27	.10	.07	.009	7.88	13.07
	44,262	54.23	.061	11.92	.83	1.72	.11	.11	.009	7.26	13.38

4. ESTIMATE of ORE RESERVES

a. Developed Ore - Factors Used

	Merch
Cubic Feet Per Ton	14
Rock Deduction	0
Per Cent Recovery	100

b. Ore Reserves as of December 31, 1956

Agnew Lease NE-NE, 11-57-21	Reserve 12-31-55	Mined 1956	Balance After Mining	Changed by Re-estimate	Reserve 12-31-56
Underground	7,500	21,649			
Open Pit Merch	25,000	577	24,423		24,423
Open Pit Wash	13,000	10,368	2,632		2,632
	45,500	32,594	27,055		27,055

Note: Based on Estimated Production

NE-NE, 11-57-21	Tons	Iron	Phos	Silica	Mang	Alum
Open Pit Merch	24,423	55.75	.050	11.00	.60	1.50
Open Pit Wash	2,632	55.50	.050	12.00	.48	1.25
	27,055	55.73	.050	11.10	.59	1.48

Note: Open Pit Ore is Hanna Trespass on Agnew
Based on Joint Estimate by CCI and Hanna

5. LABOR & WAGES

a. Comments

The labor supply was more than ample during the year. Favorable relations with the union continued. The majority of hourly employees requested their vacations before being transferred to the Hawkins mine. An increase of 0.731 tons per man per day and a decrease of $0.177 per ton in the cost of labor was made in 1956 as compared to 1955.

b. Comparative Statement of Production & Wages

Production	Agnew	Alworth	Combined
Direct Ore	21,649	5,051	26,700
Number of Days Operated	42	42	42
Average Daily Production	515	120	635
Average Number of Men Working			56
Tons Per Man Per Day			
Miners			23.99
Underground			13.73
Total Mine			9.762
Average Rate Per Day			
Surface			$18.71
Underground			$22.63
Contract Miners			$24.28
Total Mine			$21.50
Amount Paid for Labor			$58,794.52
Cost Per Ton for Labor			$2.202

6. SURFACE

a. Buildings & Repairs — None

b. Roads & Water Lines — None

c. Miscellaneous General Construction — None

7. UNDERGROUND

a. Shaft

Very little repairs were made to the shaft during the year. Everything in the shaft was left intact when the underground was abandoned except for removal of skips, cage, and counter-weights. The Alworth air shaft was filled in with the approval of the fee inspectors before the mine was abandoned.

b. Development — None

c. Mining

Mining was carried forward with five gangs employed caving and drifting in the Agnew and two gangs slicing in the Alworth. If mining were continued beyond February 28, three gangs would have been employed in the Agnew and one in the Alworth and operations would have been very costly from that date on to exhaustion. All salvable equipment and material was removed and brought to surface during March.

d. Timber, Explosives, Etc.

The timber supply was ample and of good quality. Timber inventories were held at a minimum with only enough timber ordered to insure a supply of timber for a few days at a time.

e. Pumping & Drainage

Pumping from the underground was discontinued on March 20; all pumps were removed and stored on surface.

8. BENEFICIATION None

9. MAINTENANCE & REPAIRS

Only necessary repairs were made to equipment essential to carry through the abandonment of the mine.

10. COST of PRODUCTION

a. Comparative Cost Statement

	Actual	
	1956	1955
Direct Ore	17,174	108,287
Stockpile Overrun	4,475	7,335
	21,649	115,622
South Agnew Boundary Ore	10,945	26,412
North Pillar Contract Mining		27,123
Total Production	32,594	169,157

	Actual 1956	1955
Average Daily Product	776.05	668.60
Tons Per Man Per Day - Combined	9.762	9.033
Days Operated	42	253
Costs		
Underground	$2.171	$2.401
Surface	0.393	0.310
General Mine	0.496	0.532
Cost of Production	$3.060	$3.243
Depletion-Original Cost	0.061	0.062
Depreciation-Plant & Equipment	0.092	0.297
Amortization-Development	0.178	0.009
Taxes		
Ad Valorem	0.099	0.042
Occupational	-0.135	0.059
Royalty	0.154	0.091
Total Depreciation-Depletion-Taxes	$0.449	$0.560
Loading & Shipping	0.326	0.084
Contract Pumping-Morton Ore Company	0.018	
Administrative Expenses	0.050	0.050
Miscellaneous Income & Expense	-0.296	0.058
	$3.607	$3.995
Royalty	0.688	0.681
South Agnew Boundary Ore	3.608	3.600
North Pillar Contract Mining		3.018
Total Cost-Including Royalty	$4.065	$6.206

b. Cost Comments

Costs were lower in 1956 than in 1955 because of an increase in tons of ore produced per man per day.

11. EXPLORATION & FUTURE EXPLORATION

An exploratory drilling program had been proposed and rejected before abandoning the mine.

12. TAXES

	1956		1955		Increase-Decrease	
Real Estate	Assessed Value	Taxes	Assessed Value	Taxes	Assessed Value	Taxes
Mineral	$13,900	$1,808.81	$28,073	$3,579.02	-$14,173	-$1,770.21
Lands,Bldgs,Machinery	2,584	336.25	6,532	832.76	- 3,948	- 496.51
Personal Property						
Equipment	200	26.02	2,358	300.62	- 2,158	- 274.60
Stockpile			1,049	133.74	- 1,049	- 133.74
	$16,684	$2,171.08	$38,012	$4,846.14	-$21,328	-$2,675.06
Average Mill Rate		130.13		127.49		

Note: Mineral valuation decreased by production, although per ton value on reserve was increased 10 per cent. Buildings and machinery were reduced to a salvage value. Operating equipment and stockpiles were removed from property before May 1 after termination of operations.

13. ACCIDENTS & PERSONAL INJURY — None

14. PROPOSED NEW CONSTRUCTION — None

15. EQUIPMENT RECEIVED & PROPOSED NEW EQUIPMENT — None

ALWORTH LAND RESERVE

ANNUAL REPORT

YEAR 1956

1. GENERAL

Operations continued on a 2-shift, 5-day-per-week schedule until February 28 when production was terminated and salvage operations began. Removal of conveyor equipment, locomotives, cars, tuggers, pumps, rail, pipe, etc., from the underground was completed during March. Crews were then transferred to other mines. All underground equipment was either sold, transferred, scrapped, or stored at the Central Warehouse. Some of the items left on the property are the ore and cage hoists, pumps, motors, and lockers. All of the buildings, headframe, and trestle have been left intact. A temporary cover of rail has been put over the shaft opening; however, other arrangements will have to be made to provide a more permanent cover for the shaft opening when and if the property is abandoned completely and the lease given up.

Stockpile loading of the Agnew-Alworth stockpile began on April 13 and was completed on April 25. 33,317 tons of Agnew ore and 6,534 tons of Alworth ore were loaded out of stockpile. The stockpile was loaded out by the Haley-Young Mining Company and car spotting service was obtained from the Great Northern Railway Company.

The Rhude-Gilbert Company continues mining in the open pit section of the Alworth. 165,947 tons of direct ore were shipped during the year.

2. PRODUCTION-SHIPMENTS-INVENTORIES

a. Production & Shipments

Alworth	Production	Shipments
Underground Shaft	5,051	6,534
Open Pit Direct	165,947	165,947
	170,998	172,481

c. Inventories — None

d. Production by Months

Month	Underground Shaft	Open Pit Direct	Total
Jan.	2,160		2,160
Feb.	1,966		1,966
April	925	3,380	4,305
May		15,946	15,946
June		45,956	45,956
Aug.		20,407	20,407
Sept.		37,671	37,671
Oct.		25,324	25,324
Nov.		17,263	17,263
	5,051	165,947	170,998

3. ANALYSIS

a. Analysis of Production

Alworth	Tons	Iron	Phos	Silica	Mang	Alum	Moisture
Underground Shaft	5,051	54.23	.060	12.42	.75	1.48	14.05
Open Pit Direct	165,947	56.27	.071	9.35	1.25	2.82	15.99
	170,998	56.21	.071	9.44	1.24	2.78	15.93

b. Tonnage & Complete Analysis of Ore Shipped

Alworth	Tons	Iron	Phos	Silica	Mang	Alum	Lime	Mag	Sulf	Ign Loss	Moisture
Underground Shaft	6,534	54.21	.060	12.45	.76	1.49	.12	.12	.009	7.07	13.98
Open Pit Direct N-B	165,947	56.27	.071	9.35	1.25	2.82	.18	.16	.003	5.07	15.99
	172,481	56.19	.071	9.47	1.23	2.77	.18	.16	.003	5.15	15.91

c. Analysis of Ore in Stockpile — None

4. ESTIMATE of ORE RESERVES

a. Developed Ore - Factors Used

Material	Cubic Feet Per Ton	Rock Deduction	Per Cent Recovery
Merch	14	0	100
Siliceous Merch	14	10	90
Wash Concentrates	14	0	61
Low Grade Wash Concentrates	14	0	60
Lean Wash Concentrates	14	0	46
Retreat Concentrates	14	0	40

b. Estimate of Ore Reserves as of December 31, 1956

Lease	Reserve 12-31-55	Mined 1956	Balance after Mining	Changed by Re-estimate	Reserve 12-31-56
Alworth	437,205	231,644	205,561	+2,551	208,112

c. Estimated Analysis of Ore Reserves

Alworth	Tons	Iron	Phos	Silica	Mang	Alum
Bessemer Merch Open Pit	97,832	57.18	.030	9.91	.22	.48
Non-Bessemer Merch Open Pit	1,285	58.26	.091	7.16	1.01	2.35
Bessemer Wash Concentrates Open Pit	8,236	57.45	.034	9.45		
Non-Bess Wash Concentrates Open Pit	35,738	55.70	.058	12.92		
Non-Bess Retreat Concentrates Open Pit	32,415	58.20	.078	10.32		
Non-Bess Siliceous Merch Open Pit	32,606	52.73	.084	15.79	.40	1.60
	208,112	56.40	.051	11.38	.27	.78
Merch						
Bessemer	97,832	57.18	.030	9.91	.22	.48
Non-Bessemer	1,285	58.26	.091	7.16	1.01	2.35
Non-Bessemer Siliceous	32,606	52.73	.084	15.79	.40	1.60
	131,723	56.09	.044	11.34	.27	.78

Concentrates	Tons	Iron	Phos	Silica	Mang	Alum
Bessemer Wash	8,236	57.45	.034	9.45		
Non-Bessemer Wash	35,738	55.70	.058	12.92		
	43,974	56.03	.054	12.27		
Non-Bess Retreat	32,415	58.20	.078	10.32		
	76,389	56.95	.064	11.44		
Grand Total-Alworth	208,112	56.41	.051	11.37	.27	.78

5. LABOR & WAGES

a. Comments

Labor supply was more than ample during the year. Favorable relations with the local union continued during the year. The majority of hourly employees requested vacations before being transferred to the Hawkins mine. An increase of 0.731 tons per man per day and a decrease of $0.177 per ton in cost of labor was made in 1956 over 1955.

b. Comparative Statement of Production & Wages

Production	Agnew	Alworth	Combined
Direct Ore	21,649	5,051	26,700
Number of Days Operated	42	42	42
Average Daily Production	515	120	635
Average Number of Men Working			56
Tons Per Man Per Day			
Miners			23.99
Underground			13.73
Total Mine			9.762
Average Rate Per Day			
Surface			$18.71
Underground			22.63
Contract Miners			24.28
Total Mine			21.50
Amount Paid for Labor			$58,794.52
Labor Cost Per Ton			$2.202

6. SURFACE

a. Buildings & Repairs — None

b. Roads & Water Lines — None

c. Miscellaneous General Construction — None

7. UNDERGROUND

a. Shaft

Very little repairs were made to the shaft during the year. Everything in the shaft was left intact when the underground was abandoned except for removing the skips, cage, and counterweights. The Alworth air shaft was filled in with the approval of the fee inspectors before the mine was abandoned.

b. Development — None

c. Mining

Mining was carried forward with five gangs employed caving and drifting in the Agnew and two gangs slicing in the Alworth. If the mining operation were continued beyond February 28, there would have been three gangs employed in the Agnew and one gang in the Alworth. The operation would have been very costly from that date on to exhaustion. All salvable equipment and material was removed and brought to surface during the month of March.

d. Timber, Explosives, Etc.

The timber supply was ample and of good quality. Timber inventories were kept at a minimum with only enough timber ordered to keep a few day's supply at a time.

e. Pumping & Drainage

Pumping from the underground was discontinued on March 20. All pumps were removed and stored on surface.

8. BENEFICIATION — None

9. MAINTENANCE & REPAIRS

Only essential repairs were made to equipment in order to carry through to the abandonment of the mine.

10. COST of PRODUCTION

a. Comparative Cost Statement

Product	Actual 1956	1955
Direct Ore	4,126	41,414
Stockpile Overrun	925	3,620
	5,051	45,034
Average Daily Product	120.26	178.00
Tons Per Man Per Day (Combined)	9.762	9.033
Days Operated	42	253
Costs		
Underground	$3.135	$2.925
Surface	0.409	0.322
General Mine	0.748	0.553
Cost of Production	$4.292	$3.800
Depletion-Original Cost	0.061	0.062
Depreciation-Plant & Equipment		0.296
Amortization-Development		0.009
Taxes		
Ad Valorem	1.709	0.115
Occupational	- 0.118	-0.020
Royalty	0.121	0.105
Total Depreciation,Depletion,Taxes	$1.773	$0.567
Loading & Shipping	0.271	0.114
Miscellaneous Income & Expense	0.050	0.037
Total Cost at Mine	$6.386	$4.518
Royalty	0.688	0.680
Total Cost Including Royalty	$7.074	$5.198

b. Cost Comments

Costs were higher in 1956 than in 1955 due mainly to the higher percentage of Alworth ore mined to the total Agnew and Alworth ore mined.

11. EXPLORATION & FUTURE EXPLORATION

An exploratory drilling program had been proposed and rejected before abandonment of the mine.

12. TAXES

	1956		1955		Increase-Decrease	
Real Estate	Assessed Value	Taxes	Assessed Value	Taxes	Assessed Value	Taxes
Mineral	$82,110	$14,303.56	$109,848	$19,604.58	-$27,738	-$5,301.02
Land	2,667	464,59	2,667	475.98		- 11.39
Bldgs,Mach(Accts Rec)	5,288	921.17	4,274	762.78	1,014	158.39
Personal Property						
Equipment			933	166.51	- 933	- 166.51
Stockpile			1,298	231.65	- 1,298	- 231.65
	$90,065	$15,689.32	$119,020	$21,241.50	-$28,955	-$5,552.18
Average Mill Rate		174.20		178.47		- 2.45

Mineral value decreased by production, although per ton value was increased 10 per cent. Blanket increase of all buildings in village of 25 per cent. All personal property, equipment, and stockpiles removed from property before May 1 at termination of operations.

13. ACCIDENTS & PERSONAL INJURY — None

14. PROPOSED NEW CONSTRUCTION — None

15. EQUIPMENT RECEIVED & PROPOSED NEW EQUIPMENT — None

CANISTEO MINE

ANNUAL REPORT

YEAR 1956

1. GENERAL

Concentrating plant and pit equipment repairs, underway in the fall of 1955, continued from January 1 until the start of ore season on April 16.

Truck stripping operations begun in the fall of 1955 continued on a 3-shift, 5-day-week schedule until January 13 when all pit operations were shut down.

66,585 tons of ore loaded from stockpile from April 11 to May 7 depleted the 1955 stockpile.

Ore operations were started on a 2-shift, 6-day-week schedule on April 16 with a third shift crew in the pit on cleanup. On May 28, this crew was transferred to the Holman mine for pit cleanup operations.

All operations were shut down from June 30 to August 7 by the steel strike. After settlement of the strike, ore operations were resumed on a 2-shift, 6-day-week schedule with a third shift alternating between the Canisteo and Holman mines to make up for lost production. Ore production ceased on October 26.

2,236,524 tons of crude ore (including 173,182 tons of screen rock) were mined during the year. This ore was produced from three separate leases in the pit at an average rate of 7,487 tons per shift. In addition, 260,226 tons of pit rock, lean ore, and cleanup were moved during mining.

Operating on the same schedule as the pit, the concentrating plant received 2,063,342 tons of crude ore and produced 932,409 tons of concentrates at an average rate of 3,238 tons per shift.

The fine ore plant was operated on a 3-shift, 6-day-week schedule with a third shift operating either on classifier overflows or basin tailings, depending on the operation at the main plant.

86,708 tons of fine ore concentrates were produced at an average rate of 222 tons per shift and included 56,954 tons from classifier overflows at 201 tons per shift and 29,754 tons from the tailings basin at 278 tons per shift.

After shutdown of ore operations, ore was shipped from stockpile intermittently until November 28. 172,763 tons were shipped from stockpile, leaving 91,886 tons in stockpile at the end of the 1956 season.

At the close of ore season, pit operations were immediately diverted to Canisteo truck stripping on a 20-shift-per-week schedule which was completed on December 8 when crews and equipment were transferred to the Sally mine for stripping operations.

686,354 cubic yards of stripping were removed in 1956 at an average of 4,701 cubic yards per shift.

Necessary repairs to plant equipment were started immediately after the end of ore season and continued into 1957.

Mine crews began installation of scrubber facilities at the Canisteo plant in October with completion scheduled by May 1, 1957.

Three structure holes were drilled to a depth of 574 feet to outline the limits of mineable ore in the plant site area.

2. PRODUCTION-SHIPMENTS-INVENTORIES

a. Production by Grades

Crude	Wash	Retreat	Tailings Basin Fines	Total
Snyder	1,073	565,763		566,836
Bovey	2,279	680,742		683,021
Hemmens		813,485		813,485
Canisteo			122,123	122,123
	3,352	2,059,990	122,123	2,185,465

Concentrates	Wash Bess	Wash Non-Bess	Retreat Bess	Retreat Non-Bess	Tailings Basin Fines Bess	Tailings Basin Fines Non-Bess	Overflow Bess	Overflow Non-Bess	Total
Snyder	5	813	3,842	247,922			6,998	9,430	269,010
Bovey	36	1,480	2,404	325,859			785	19,220	349,784
Hemmens			29,038	321,010			2,064	18,457	370,569
Canisteo					8,112	21,642			29,754
	41	2,293	35,284	894,791	8,112	21,642	9,847	47,107	1,019,117

b. Shipments by Grades

	Wash Bess	Retreat Bess	Retreat Non-Bess	Overflow Bess	Overflow Non-Bess	Tailings Basin Fines Bess	Tailings Basin Fines Non-Bess	Stockpile Bess	Stockpile Non-Bess	Total
Snyder	473	2,160	177,443	6,998	9,430					196,504
Bovey			228,165	785	18,693					247,643
Hemmens		26,724	226,492	2,064	18,457					273,737
Canisteo						8,112	21,642			29,754
1956 Canisteo								6,442	166,319	172,761
1955 Canisteo								6,832	66,585	73,417
	473	28,884	632,100	9,847	46,580	8,112	21,642	13,274	232,904	993,816

c. Stockpile Inventories

	Wash	Retreat	Total
Snyder	69	23,998	24,067
Bovey	526	34,287	34,813
Hemmens		33,006	33,006
	595	91,211	91,886

d. Production by Months - Crude Ore

Month	Snyder Wash	Snyder Retreat	Bovey Wash	Bovey Retreat	Hemmens Retreat	Tailings Basin Fines	Total
April		67,884		88,610		2,456	158,950
May		323,822		53,429		28,175	405,426
June	1,073	64,727		191,873	93,132	27,944	378,749
Aug		24,036		287,972	20,497	26,674	359,179
Sept		69,757		33,050	414,552	7,175	524,534
Oct		15,537	2,279	25,808	285,304	29,699	358,627
	1,073	565,763	2,279	680,742	813,485	122,123	2,185,465

Concentrates

Month	Snyder Wash	Snyder Retreat	Snyder O'Flow	Bovey Wash	Bovey Retreat	Bovey O'Flow	Hemmens Retreat	Hemmens O'Flow	Tailings Basin Fines	Total
April		30,356	2,068		42,910	2,618			663	78,615
May	143	143,477	9,147	2	28,045	1,363	1,768		7,393	191,338
June	675	27,298	1,872		90,590	7,433	37,710	1,488	6,573	173,639
July					128	26	151	12	6	323
Aug		11,304	652		133,771	6,544	8,271	360	6,098	167,000
Sept		32,670	2,265		20,613	1,205	174,186	9,908	1,395	242,242
Oct		6,659	424	1,514	12,206	816	127,962	8,753	7,626	165,960
	818	251,764	16,428	1,516	328,263	20,005	350,048	20,521	29,754	1,019,117

3. ANALYSIS

a. Crude Ore

Material	Tons	Iron	Silica
Snyder			
Wash	1,073	43.30	30.70
Retreat	565,763	45.22	29.35
Bovey			
Wash	2,279	45.30	29.00
Retreat	680,742	45.58	27.62

Material	Tons	Iron	Silica
Hemmens Retreat	813,485	44.14	29.28
Tailings Basin Fines	122,123	30.19	52.18
	2,185,465	44.09	30.06

b. Tonnage & Analysis of Concentrates Produced

	Concentrates	Tons	Iron	Phos	Silica	Mang	Alum	Moisture
Snyder:	Bessemer Wash	5	57.08	.047	11.93	.33	.44	6.24
	Non-Bessemer Wash	813	54.36	.060	13.35	1.31	1.13	7.18
	Bessemer Retreat	3,842	57.89	.045	11.17	.32	.48	6.29
	Non-Bessemer Retreat	247,922	57.49	.055	11.38	.43	.55	7.52
	Bessemer Overflow	6,998	57.84	.037	12.97	.28	.46	6.79
	Non-Bessemer Overflow	9,430	57.81	.042	12.78	.34	.47	6.84
Bovey:	Bessemer Wash	36	57.08	.047	11.93	.33	.44	6.24
	Non-Bessemer Wash	1,480	55.31	.058	14.16	.37	.50	6.45
	Bessemer Retreat	2,404	57.08	.047	11.93	.33	.44	6.24
	Non-Bessemer Retreat	325,859	56.25	.079	12.15	.42	.47	6.50
	Bessemer Overflow	785	55.36	.041	15.35	.24	.58	7.58
	Non-Bessemer Overflow	19,220	56.69	.055	12.94	.30	.43	6.72
Hemmens:	Bessemer Retreat	29,038	57.33	.038	10.75	.35	.53	7.63
	Non-Bessemer Retreat	321,010	55.59	.053	11.47	1.11	.55	7.41
	Bessemer Overflow	2,064	57.50	.031	11.94	.60	.64	8.15
	Non-Bessemer Overflow	18,457	56.72	.033	13.14	.52	.50	7.72
Canisteo:	Tailings Basin Bess Fines	8,112	57.47	.037	11.91	.39	.42	7.24
	Tailings Basin Non-Bess Fines	21,642	56.93	.041	12.25	.45	.44	7.82
		1,019,117	56.45	.060	11.75	.65	.50	7.14

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c. Tonnage & Analysis of Concentrates Shipped

Material	Tons	Iron	Phos	Silica	Mang	Alum	Lime	Mag	Sulfur	Ign Loss	Moist.
Snyder											
Non-Bessemer Wash	473	52.61	.060	14.41	1.96	1.51	.18	.30	.015	5.41	7.50
Bessemer Retreat	2,160	58.52	.043	10.58	.31	.51	.18	.30	.015	4.20	6.33
Non-Bessemer Retreat	177,443	57.73	.053	11.21	.42	.56	.18	.30	.015	4.47	7.67
Bessemer Overflow	6,998	57.84	.037	12.97	.28	.46	.18	.30	.015	2.89	6.79
Non Bessemer Overflow	9,430	57.81	.042	12.78	.34	.47	.18	.30	.015	3.01	6.84
Bovey											
Non-Bessemer Retreat	228,165	56.21	.083	12.12	.42	.46	.17	.30	.015	5.77	6.31
Bessemer Overflow	785	55.36	.041	15.35	.24	.58	.17	.30	.015	3.99	7.58
Non-Bessemer Overflow	18,693	56.69	.055	12.94	.30	.43	.17	.30	.015	4.53	6.72
Hemmens											
Bessemer Retreat	26,724	57.35	.037	10.65	.35	.54	.18	.30	.015	5.73	7.75
Non-Bessemer Retreat	226,492	55.27	.051	11.23	1.35	.55	.18	.30	.015	6.64	7.44
Bessemer Overflow	2,064	57.50	.031	11.94	.60	.64	.18	.30	.015	3.78	8.15
Non-Bessemer Overflow	18,457	56.72	.033	13.14	.52	.50	.18	.30	.015	3.94	7.72
Canisteo Tailings Basin											
Bessemer Fines	8,112	57.47	.037	11.91	.39	.42	.18	.30	.016	4.36	7.24
Non-Bessemer Fines	21,642	56.93	.041	12.25	.45	.44	.18	.30	.016	4.68	7.82
Canisteo Stockpile											
1956 Bessemer	6,442	57.08	.047	11.93	.33	.44	.18	.30	.015	4.94	6.24
1956 Non-Bessemer	166,319	56.41	.062	12.14	.43	.54	.18	.30	.015	5.41	7.08
1955 Bessemer	6,832	55.95	.088	11.26	.51	.52	.18	.30	.015	6.79	6.14
1955 Non-Bessemer	66,585	56.09	.075	11.79	.45	.48	.18	.30	.015	6.22	6.48
	993,816	56.41	.061	11.73	.63	.52	.18	.30	.015	5.56	7.07

d. Mine Analysis of Ore in Stockpile

Material	Tons	Iron	Phos	Silica	Mang	Alum	Moisture
Snyder							
Wash	69	58.30	.048	10.85	.29	.84	5.40
Retreat	23,998	57.82	.052	11.17	.50	.46	7.31
Bovey							
Wash	526	53.31	.052	17.83	.25	.42	5.30
Retreat	34,287	56.25	.085	12.36	.40	.45	6.67
Hemmens							
Retreat	33,006	56.29	.047	11.82	.69	.54	7.80
	91,886	56.66	.063	11.89	.53	.49	7.23

4. ESTIMATE of ORE RESERVES

a. Developed Ore - Factors Used

Concentrates	Cubic Feet Per Ton	Rock Deduction	Per Cent Recovery
Wash	14	0	55
Retreat	14	0	33

b. Ore Reserves as of December 31, 1956

Lease	Reserve 12-31-55	Mined 1956	Balance After Mining	Changed by Re-estimate	Reserve 12-31-56
Bovey	1,228,790	349,784	879,006	+499,932	1,378,938
Snyder	1,220,871	269,010	951,861	+ 45,208	997,069
Hemmens	1,705,806	370,569	1,335,237	-102,413	1,232,824
	4,155,467	989,363	3,166,104	+442,727	3,608,831

c. Estimated Analysis of Reserves

Concentrates	Tons	Iron	Phos	Silica
Bovey				
Bessemer Wash	176,163	58.73	.031	9.03
Non-Bessemer Wash	535,263	58.60	.091	9.11
Bessemer Retreat	214,154	56.28	.028	11.70
Non-Bessemer Retreat	453,358	56.66	.076	11.12
	1,378,938	57.62	.068	10.16
Snyder				
Bessemer Wash	500,717	61.23	.037	8.78
Non-Bessemer Wash	471,627	61.09	.054	7.80
Bessemer Retreat	20,501	55.84	.032	12.34
Non-Bessemer Retreat	4,224	59.37	.049	8.17
	997,069	61.05	.045	8.39
Hemmens				
Bessemer Wash	319,402	59.52	.027	9.37
Non-Bessemer Wash	302,129	58.71	.051	8.67
Bessemer Retreat	415,223	57.60	.032	11.08
Non-Bessemer Retreat	196,070	56.78	.058	11.28
	1,232,824	58.21	.039	10.08
Mine Totals				
Bessemer Wash	996,282	60.24	.033	9.01
Non-Bessemer Wash	1,309,019	59.52	.068	8.54
	2,305,301	59.83	.052	8.74
Bessemer Retreat	649,878	57.11	.031	11.32
Non-Bessemer Retreat	653,652	56.71	.070	11.15
	1,303,530	56.91	.051	11.24
Total Bessemer	1,646,160	59.00	.032	9.92
Total Non-Bessemer	1,962,671	58.85	.068	9.41
	3,608,831	58.91	.052	9.64

5. LABOR & WAGES

a. Comments

Labor relations during 1956 were generally satisfactory. A steel strike shut down all operations from June 30 to August 7 and resulted in a new labor contract which will remain in effect until June 30, 1959, and will provide the following: a total basic wage increase of $0.215 per hour; a total increase in job class increment of $0.7; cost of living adjustments; increased Sunday, holiday, and vacation allowances; and other fringe benefits. No new men other than those on preferential lists from other locals were hired during 1956.

b. Comparative Statement of Production & Wages

Production-tons	1,019,117
Number of Days Operated	142
Number of Shifts Operated	288
Average Product per Shift-tons	3,238
Average Number of Men Employed	141
Product Per Man Per Day-tons	48.72
Average Wages Paid per Day	$22.56
Total Amount Paid for Labor	$471,932.75
Labor Cost Per Ton	$0.463

6. GENERAL SURFACE

a. Buildings & Repairs

No new buildings were constructed during 1956, and repairs were minor.

b. Roads, Transmission Lines, Etc.

There were no major road or transmission line changes during 1956.

c. Miscellaneous General Construction

Because the Oliver Iron Mining Division King Mine stripping cut off the surface water drainage ditch to the south, it was necessary to construct a ditch, sump, and pumping station to divert

this drainage to the north. This work was authorized under E&A No. CC-785 and completed within the budget estimate at a cost of $21,494.03, the expense being shared on a fifty-fifty basis with the Oliver Iron Mining Division.

E&A No. CC-747 authorized installation of a new track lighting system at a cost of $4,619.51.

E&A No. CC-836 authorized installation of scrubber facilities at a cost of $397,886. This installation was started in October and is scheduled for completion on May 1, 1957. Most of this work involves the rearrangement of equipment and alterations to the existing washing plant. The only piece of equipment that will require additional housing will be the scrubber itself which will extend out of the southeast side of the main building. Additional equipment required will be one 12'x10' scrubber, two 6x20 double-deck screens, 180' of 36" conveyor, four pumps, two 24" cyclones, and additional transformer capacity and miscellaneous electrical equipment. The flowsheet has been set up so that all of the ore down to the -65 mesh can be treated by the scrubber. In this way all sizes of material will have been scrubbed prior to further treatment. It will also be possible to bypass the scrubber and use the conventional wash and retreat processes. Test data indicates that installation of scrubber facilities will upgrade all size ranges of the ore, with the greatest improvement noted on the classifier product. This will be particularly important at the Canisteo mine where there are no facilities for additional treatment of this material.

7. OPEN PIT

a. Stripping

Truck stripping operations conducted on a 3-shift, 5-day-week schedule with one shovel and 7 to 9 trucks, underway in the fall of 1955, continued until January 13 when all stripping operations were shut down. A minor amount of concurrent stripping was conducted on the night shift in May. A major portion of the above stripping was surface overburden removal from the North Bovey forties.

On October 29, stripping operations were resumed on a 20-shift-per-week schedule with two shovels and ten trucks operating.

Stripping at the Canisteo mine was completed on December 8 and crews and equipment immediately transferred to the Sally mine for stripping operations.

E&A No. CC-759 for $72,860 was authorized to cover the removal of 260,000 cubic yards of surface and lean ore material from the Bovey and Hemmens properties at a cost of $0.280 per cubic yard. This E&A covered stripping in December of 1955 and January and May of 1956. 160,360 cubic yards were removed during 1956 at a cost of $0.296 per cubic yard for a total of $47,508.99.

E&A No. CC-852 and CC-852-S in the amount of $180,445 was authorized to cover the removal of 452,000 cubic yards of surface and lean ore material from the North Bovey and West Snyder forties at a cost of $0.399 per cubic yard. The program was completed after the removal of 525,994 cubic yards at a cost of $0.373 for a total expenditure of $196,347.29.

686,354 cubic yards of truck stripping were removed in 1956 at an average rate of 4,701 cubic yards per shift and a cost of $0.295 per cubic yard for a total expenditure of $202,722.34.

Cost per yard could have been improved on both projects if more trucks had been available and if stripping operations could have been concentrated in one area.

Following is a tabulation by leases of all stripping removed:

Lease	Surface	Cretaceous	Lean	Taconite	Paint Rock	Cubic Yards
Bovey	211,205	22,844		39,880		273,929
Snyder	253,961	36,906			84,615	375,482
Hemmens	684	18,949	17,310			36,943
	465,850	78,699	17,310	39,880	84,615	686,354

b. Open Pit Mining

The 1956 ore season started on April 16 on a 2-shift, 6-day-week schedule. Pit cleanup was conducted on the third shift from the start of ore season until May 28 when the cleanup crew was transferred to the Holman mine.

All operations were shut down from June 30 to August 7 because of a steel strike. After settlement of the strike, ore operations were resumed on a 2-shift, 6-day-week schedule with a third shift crew alternating between the Canisteo and Holman mines to make up for lost production. The Canisteo mine operated on a 3-shift schedule from September 10-30. Ore operations were shut down on October 26.

The pit operated 288 shifts producing 2,236,524 tons of crude ore which included 173,182 tons of screen rock. It was necessary to operate an additional 45.5 shifts to remove 260,226 tons of pit rock, cleanup, and lean ore, making a total of 333.5 shifts operated for the removal of 2,496,750 tons of material from the pit at an average rate of 7,487 tons per shift and a cost of $0.225 per ton.

Crude ore removed from the various leases is as follows:

Lease	Tons Gross Crude
Bovey	780,677
Hemmens	850,762
Snyder	605,085
	2,236,524

340,225 tons of crude ore from the various lean ore stockpiles in the pit are included in the above tonnages.

Bovey ore was produced mainly from the North Bovey forties. Because this ore has become increasingly difficult to concentrate, smaller proportions of Bovey ore were mined than originally planned.

Hemmens ore, produced mainly from the upper horizon along the Hemmens-Walker line, was largely used to satisfy manganiferous requirements.

Snyder ore was mined in the West Snyder forties, in the pit bottom in the middle Snyder forty, and along the Snyder-Hunner line. This ore continued to be high grade.

c. Pumping & Drainage

Automatic pumping equipment installed in 1954 continues to operate satisfactorily. Mine water is pumped out of the pit in two stages. Water not used in concentrating overflows to the north and eventually enters Prairie River. Approximately 2,667 gallons per minute were pumped from the pit at a cost of $0.025 per ton of concentrates.

8. BENEFICIATION

a. Plant Operation

The concentrating plant operated on the same schedule as the pit. Crude ore feed to the plant totalled 2,063,342 tons, producing 932,409 tons of concentrates. Of this amount, 2,334 tons were wash concentrates and 930,075 tons were retreat concentrates. Concentrates were produced at an average rate of 3,238 tons per shift at a weight recovery of 45.19 per cent on plant crude and 41.69 per cent on pit crude.

Except for a very short period when wash concentrates were being produced, the Heavy-Media plant operated on the same schedule as the washing plant. Operating 287.75 shifts, the Heavy-Media plant received 730,616 tons of Heavy-Media feed and produced 442,193 tons of concentrates at a weight recovery of 60.52 per cent. Coarse Heavy-Media tailings amounted to 288,423 tons.

In general, operation of the main concentrating plant was satisfactory.

The fine ore plant was operated on a 3-shift, 6-day-per-week schedule with the third shift either on classifier overflows or basin material, depending on the operations at the main plant. 86,708 tons of fine ore concentrates were produced at an average rate of 222 tons per shift, including 56,954 tons from classifier overflows at 201 tons per shift and 29,754 tons from basin tailings at 278 tons per shift.

Except for some difficulties with the operation of the cyclone feed pump, the fine ore plant operated satisfactorily. A new pump has been installed which should eliminate this pumping problem.

Concentration data for the year is as follows:

Wash Product	Tons	Per Cent Weight Plant	Per Cent Weight Pit	Per Cent Iron	Per Cent Phos	Per Cent Silica	Iron Units
Crude to Plant	3,352	100.00	87.16	44.66		29.54	
Screen Plant Rock	494		12.84	24.68		60.27	
Pit Crude	3,846		100.00	42.10		33.49	
Concentrates Produced	2,189	65.30	56.92	53.58	.053	16.43	78.35
Stockpile Overrun	145	4.33	3.77				
Total Concts Produced & Shipped	2,334	69.63	60.69	53.58	.053	16.43	83.54
Total Fine Tailings (by difference)	1,017	30.37	26.47	24.10		60.67	
Retreat Product							
Crude to Plant	2,059,990	100.00	91.23	44.91		28.75	
Pit Rock	25,241		1.12	25.01		60.63	
Screen Plant Rock	172,668		7.65	26.27		59.12	
Pit Crude	2,257,920		100.00	43.26		31.42	
Concentrates Produced	923,388	44.82	40.89	56.43	.062	11.60	56.31
Stockpile Overrun	6,687	.33	.30				
Total Concts Produced & Shipped	930,075	45.15	41.20	56.43	.062	11.60	56.74
Heavy-Media Concentrates	442,193	21.47	19.58	56.78		10.65	
Heavy-Media Rejects	288,423	14.00	12.77	45.39		26.22	
Heavy-Media Feed	730,616	35.47	32.35	52.94		15.69	
Total Fine Tailings (by difference)	841,492	40.85	37.26	32.01		48.56	
Fine Ore Plant							
Crude to Plant	891,091	100.00		25.92		58.53	
Total Concts Produced & Shipped	86,708	9.73		57.02	.042	12.73	21.41
Total Fine Tailings (by difference)	804,382	90.27		22.57		63.47	

During the operating season, it was necessary to stockpile 264,649 tons of concentrates. Of this amount, 172,763 tons were removed from stockpile, leaving a balance in stock of 91,886 tons on January 1, 1957.

Following is a brief classification of delays at the Washing and Heavy-Media plants, showing time lost and percentage of delay time as compared to total time worked:

Washing Plant

Source of Delay	Hours	Per Cent of Total Hours Worked
Out of Ore	3.00	0.13
Screening Plant Machines	15.25	0.66
Screening Plant Pocket & Rock Chute	10.75	0.46
Electric Power	2.75	0.12
Pumps and Pipelines	3.25	0.14
Washing Plant Machines	24.75	1.07
Conveyors	21.00	0.91
Concentrate Stacker	7.50	0.32
Cold Weather	5.75	0.25
	94.00	4.06

Retreat Plant

Media Circuit	3.50	0.13
Conveyors	5.00	0.19
Electric Power	2.50	0.09
Heavy-Media Plant Machines	11.50	0.43
Pumps and Pipelines	4.00	0.15
Cold Weather	1.50	0.06
Plant Tieup	2.75	0.10
	30.75	1.15

9. MAINTENANCE & REPAIRS

Repairs to plant equipment continued until the start of ore season on April 16. In addition to normal repair work at the concentrating plant, facilities for splitting coarse-fines concentrates were installed, involving installation of additional conveyors and a loading bin so that +1/8" and -1/8" material could be loaded out separately.

A limited amount of truck and shovel repair was done prior to the start of the 1956 ore season. At the close of ore season, repairs to concentrating plant equipment were resumed and continued into 1957.

10. COST of PRODUCTION

a. Comparative Mining Costs

Product	1956	1955
Wash Concentrates	2,334	17,345
Retreat Concentrates	930,075	891,468
Fine Ore Concentrates	86,708	106,524
	1,019,117	1,015,337
Per Cent Gross Crude Recovery*	41.69	41.00
Average Product Per Shift*	3,238	3,112
Tons Per Man Per Day	48.72	49.32
Days Operated	141	159

*Excluding Fine Ore Concentrates

Costs	Budget 1956	Actual 1956	Actual 1955
Pit Operating-Total Material	$0.242	$0.225	$0.207
Beneficiation-Net Crude	0.172	0.158	0.148
Fine Ore Concentrating	1.236	1.155	0.913
Loading Stockpile Ore	0.012	0.010	0.009
Sampling and Analysis	0.028	0.028	0.029
Safety and First Aid Supplies	0.001	0.001	0.000
Employees Vacation Pay	0.036	0.042	0.038
Personal Injury Expense	0.003	0.002	0.003
Social Security Taxes	0.022	0.019	0.022
Total Pit and Beneficiation	1.153	1.071	0.987
General Mine Expense	0.112	0.105	0.113
Winter & Idle	0.308	0.320	0.312
Cost of Production	$1.573	$1.496	$1.412
Depreciation			
Plant & Equipment		0.218	0.216
Motorized Equipment		0.050	0.046
Movable Equipment		0.004	0.005

Costs	Budget 1956	Actual 1956	Actual 1955
Amortization			
Leasehold		$0.126	$0.126
Stripping		0.158	0.158
Taxes			
Ad Valorem		0.124	0.163
Occupational		0.559	0.543
Royalty		0.045	0.044
Total			
Depreciation-Amortization-Taxes		1.277	1.301
Miscellaneous Expense & Income		0.000	0.000
Royalty		0.338	0.334
Total Cost at Mine		$3.111	$3.032

b. Detailed Cost Comparison

Over-all mining costs for 1956 were $0.077 under the 1956 budget estimate and $0.084 over 1955 costs. A higher rate of concentrate production per shift than originally estimated was the main reason for 1956 costs being under the budget. The increased rate of production was due in part to higher recovery ore being mined and to minimum downtime at both the pit and plant. The increase in costs over 1955 can be accounted for almost entirely by the increase in wages and cost of supplies.

Pit operating costs were $0.017 under the budget and $0.018 over 1955 actual costs. Drilling and blasting, truck operating, and shovel maintenance showed the widest variation in costs. The use of fertilizer grade ammonium nitrate for blasting decreased costs in 1956. A considerable amount of repair work on shovel equipment was done during the operating season, which is the main reason for the increase in shovel maintenance costs.

Beneficiation costs were $0.014 under the budget estimate and $0.010 over 1955 actual costs. Concentrating operating costs account for most of the variation between the 1956 actual and the budget. The largest increases in costs over 1955 are noted under General Mill expense and loading and stocking.

Fine ore concentration costs were $0.081 under the budget and $0.242 over 1955 costs. A decreased rate of production, due almost entirely to lower recovery on both classifier overflow and basin material, accounts for the increase over 1955 costs.

General mine expense was $0.007 below the budget and $0.008 below 1955 costs.

Winter & Idle costs were $0.012 over the budget and $0.008 over 1955 costs.

11. EXPLORATION & FUTURE EXPLORATION

During 1956, the Henry Schultze Company drilled three structure holes to a depth of 574 feet in the vicinity of the existing plant site to outline limits of mineable ore in this area and to determine the advisability of constructing further plant additions at the present plant site. Results indicated there was not a sufficient quantity of ore to warrant making changes in the location of the plant site for either existing or future facilities.

There are two areas of interest requiring additional drilling before ultimate pit limits can be definitely established: one is along the east and south side of the pit on the Hemmens and South Bovey forties; the other is on the north side of the pit on the North Bovey forties.

12. TAXES

	1956		1955		Increase-Decrease	
Real Estate	Assessed Value	Taxes	Assessed Value	Taxes	Assessed Value	Taxes
Mineral	$650,208	$112,685.35	$ 788,220	$127,387.81	-$138,012	-$14,702.46
Land,Bldg,Machinery	80,289	14,194.29	79,873	13,154.33	416	1,039.96
Personal Property						
Equipment	99,556	17,206.26	112,444	18,147.34	- 12,888	- 941.08
Stockpile	2,155	372.45	8,356	1,348.57	- 6,201	- 976.12
Tailings Basin Stockpile	42,141	7,283.23	36,231	5,847.32	5,910	1,435.91
	$874,349	$151,741.58	$1,025,124	$165,885.37	-$150,775	-$14,143.79
Average Mill Rate		173.55		161.82		- 11.73

Average mill rate increased by 7.09 per cent. Overall reduced by reduction of reserves by production although mineral reserve per ton values increased by 5 per cent. Personal property equipment reduced by normal depreciation and some equipment away from property. Tailings basin value increased by State from $0.25 per ton to $0.406 per ton.

13. ACCIDENTS AND PERSONAL INJURY

Seven slight accidents occurred at the Canisteo during 1956 and four lost-time accidents as described below:

Name	Injury		Cause	Time Lost		Compensation Paid
	Date	Nature		Weeks	Days	
Theodore Ruotsala	2-6	Fracture left ankle	Using axe to square up end of pole, hand slipped on frosted axe handle and axe glanced off pole striking ankle.	6	2	$254.00 plus 5% Disability
Roy Cartwright	5-4	Contusion and abrasion upper third anterior surface-left leg.	While tightening bolts on screen, stepped into space between base of old crusher and floor in back of 5' pans.	7	1	$287.00
Ralph Trout	8-29	Contusion left lower laterial chest. Fractured 11th rib.	In moving portable screen, Trout was struck on left side by 54-B dragline truck panel.	4	1	$167.00
Earl Luoma	10-19	Strained lower back.	Felt sharp pain in back while pushing bell when on mast lining up bell for drill stem and bolt holes.	4	4	$187.00

14. PROPOSED NEW CONSTRUCTION

The following projects are planned for construction in 1957:

1. Remodel Crude Conveyor & Screening Plant

With the increased amount of screen rock, particularly from the Bovey lease, present facilities are not adequate for efficient handling and disposal of screen rock. Installation of a rock pocket at the end of the existing 5' pan has been proposed and would eliminate the necessity of using two or more trucks for rock disposal.

It is further planned to bring the #1 pit conveyor up out of the pit below the screening plant, thus eliminating a bad loading and spillage condition. This can be done by inserting a vertical curve in the south end of the #1 pit conveyor.

Cost of this remodeling, including resheeting of the existing structure, is estimated at $40,000.

2. Remodel Concentrate Stockpiling System

It is planned to replace the 24" conveying system on the trailing section and the stacker either with new 30" equipment or 36" equipment from the stripping conveyor. The existing stacker will also require some alterations. This remodeling will improve operations by eliminating spillage, increasing life of the belting, and by cutting manpower requirements. It will also permit a better job of concentrate bedding which cannot be done with present equipment. Cost of this project is estimated at $30,000.

3. Resheeting Washing Plant and Crude Ore Conveyors

The present sheeting on the washing plant and conveyors is in bad shape and should be replaced to improve working conditions, protect equipment, and improve the general appearance of the plant. The cost of this project is estimated at $30,000.

15. EQUIPMENT RECEIVED & PROPOSED NEW EQUIPMENT

a. Equipment Received

2	Pickup Trucks
7	34-ton Euclid Trucks (Used)
1	7½ ton Hoist for Washing Plant
1	Vibrator for Crude Ore Pocket
1	14x12 AC Cyclone Feed Pump for Fine Ore Plant
3200'	Spiralweld 14" Pipe for Tailings Line
580'	36" Belt for Replacement on Concentrator Conveyor between Main Plant and Loading Bin.

b. Proposed New Equipment

1	34-ton Euclid Truck
2	Fresh Water Pumps for Washing Plant
1	Tractor and Blade
1	Grader
1	Rotary Drill
350'	30" Belt for Replacement on "Out of Surge" Conveyor

CUSHING MINE

ANNUAL REPORT

YEAR 1956

1. GENERAL

There was no activity on the Cushing mine proper, but the following forties were purchased from Lawrence Tanner and Othnel Johnson for $13,600:

NW-SW Section 27, 56-25
SE-NE Section 28, 56-25
E½-SE Section 28, 56-25

The following forty was purchased from Lawrence Tanner for $3,400:

SW-SW Section 27, 56-25

The purchase of the following forties from Jones & Laughlin Steel Corporation is nearing completion. The price will be $18,000 for the nine forties:

SE¼-NW¼ Section 27, 56-25
W½-NW¼ Section 26, 56-25
NE¼ Section 27, 56-25
N½-NW¼ Section 27, 56-25

The following forty has been offered to us by Mr. Oscar Gross and will be purchased for $3,400:

SE-SW Section 27, 56-25

All of the above described lands are northwest of the Cushing mine and will be used as auxiliary lands.

Cushing Mine
Annual Report
Year 1956
Page 2

Estimated Analysis of Ore Reserves is as follows:

Cushing Ore Reserves as of December 31, 1956

Concentrates	Bessemer				Non-Bessemer				
NE-SW 36-56-25	Tons	Iron	Phos	Silica	Tons	Iron	Phos	Silica	Total
Wash					118,009	57.50	.045	8.08	118,009
Retreat	71,552	56.50	.025	11.00	157,414	57.00	.050	10.00	228,966
	71,552	56.50	.025	11.00	275,423	57.21	.048	9.18	346,975
NW-SW 36-56-25									
Wash					584,285	58.02	.045	8.74	584,285
Retreat	403,813	56.50	.032	11.00	853,227	57.00	.046	10.00	1,257,040
	403,813	56.50	.032	11.00	1,437,512	57.82	.046	9.49	1,841,325
SW-SW 36-56-25									
Wash					392,152	58.91	.045	8.81	392,152
Retreat	126,141	56.50	.030	11.00	69,860	57.00	.048	10.00	196,001
	126,141	56.50	.030	11.00	462,012	58.62	.045	8.99	588,153
Total Concentrates									
Wash					1,094,446	58.28	.045	8.69	1,094,446
Retreat	601,506	56.50	.031	11.00	1,080,501	57.00	.047	10.00	1,682,007
	601,506	56.50	.031	11.00	2,174,947	57.64	.046	9.34	2,776,453

TAXES

Real Estate	1956 Assessed Value	1956 Taxes	1955 Assessed Value	1955 Taxes	Increase-Decrease Assessed Value	Increase-Decrease Taxes
Mineral	$188,051	$45,891.94	$179,153	$37,312.20	$8,898	$8,579.74
Land	2,474	603.75	1,068	222.43	1,406	381.32
	$190,525	$46,495.69	$180,221	$37,534.63	$10,304	$8,961.06
Average Mill Rate		244.04		208.27		-35.77

Average Mill Rate increased 17.17 per cent. 5 per cent increase in mineral values in Itasca County by State Tax Commissioner. Land values increased by addition of six forties purchased from Itasca County and five forties from private owners.

HAWKINS MINE

ANNUAL REPORT

YEAR 1956

1. GENERAL

Stripping operations in effect at the close of the 1955 season continued until February 9, 1956, when crews were cut to 60 men for pit and plant repair.

Repairs to pit equipment were of a general nature with no major overhauls. Major plant changes consisted of replacing wash and drain screens and installation of a scissor conveyor in the cyclone plant.

On March 23, 1956, a Joy rotary drill was received from Michigan on an experimental basis. Results showed a definite saving in drilling costs over churn drill machines. A new Joy rotary drill was received on November 23, 1956, and put into operation on December 3, 1956.

In 1956, use of fertilizer grade ammonium nitrate as a blasting agent proved very effective in dry holes. Experimental blasting was also carried on in wet holes using waterproof bags and cans. The cans, although more expensive, proved more satisfactory. The advantage of this blasting process is purely economical—it can be purchased for $0.04 per pound as compared to $0.12 per pound for regular blasting agents.

After settlement of the strike on August 6, 1956, operations were resumed on a 3-shift, 6-day-per-week schedule. Pit crude production for the year averaged 6,871 tons per shift for a total of 2,697,001 tons. Plant concentrate production was 2,191 tons per shift for a total of 847,958 tons. Pit recovery averaged 31 per cent.

In August, a plant test was run on MacKillican ore which resulted in a pit recovery of 8 per cent. MacKillican production was then discontinued and except for some line ore in the east pit, no further production is expected.

Ore operations were completed on October 20, 1956, and stripping operations were begun on a 3-shift, 5-day-per-week schedule using one shovel and seven trucks. This schedule continued until December 17 when the Sargent stripping was completed and crews were shifted to the Hawkins mine. Two shovels and twelve trucks were put into operation with the same shift schedule. Stripping operations continued to the close of the year.

The IHC fines plant was put into operation on May 1, 1956, and completed ore production on October 17, 1956.

2. PRODUCTION-SHIPMENTS-INVENTORIES

a. Production by Grades

Crude	Wash	Retreat	Total
Hawkins	3,782	2,332,741	2,336,523
MacKillican		6,117	6,117
	3,782	2,338,858	2,342,640
IHC Fines			111,408
Concentrates			
Hawkins	2,163	845,307	847,470
MacKillican		488	488
	2,163	845,795	847,958
IHC Fines			50,489

b. Shipments by Grades

	Bessemer	Non-Bessemer		Non-Bessemer Retreat	
	Retreat	Wash	Retreat	Stockpile	Total
Hawkins	34,760	2,029	748,013	15,440	800,242
MacKillican			488		488
	34,760	2,029	748,501	15,440	800,730
IHC Fines					50,489

c. Stockpile Inventories

Hawkins Wash	134
Hawkins Retreat	62,534
	62,668

d. Production by Months Crude

Month	Hawkins Wash	Hawkins Retreat	MacKillican Retreat	Total	IHC Fines
April	1,663	186,643		188,306	
May		484,673		484,673	16,752
June		480,033		480,033	17,907
Aug		429,254	6,117	435,371	26,295
Sept	2,119	437,100		439,219	33,393
Oct		312,038		312,038	17,061
	3,782	2,332,741	6,117	2,342,640	111,408

Concentrates

April	921	71,997		72,918	
May		157,998		157,998	7,505
June		172,990		172,990	5,064
July		251		251	194
Aug		162,554	488	163,042	15,532
Sept	1,242	163,293		164,535	13,498
Oct		116,224		116,224	8,696
	2,163	845,307	488	847,958	50,489

3. ANALYSIS

a. Tonnage & Analysis of Crude Ore Produced

Material	Tons	Iron	Silica
Hawkins Wash	3,782	43.30	34.26
Hawkins Retreat	2,332,741	40.48	37.00
MacKillican Retreat	6,117	27.10	55.60
	2,342,640	40.45	37.04

b. Tonnage & Analysis of Concentrates Produced

Hawkins	Tons	Iron	Phos	Silica	Mang	Alum	Moisture
Non-Bessemer Wash	2,163	52.51	.072	16.88	.45	.56	7.72
Bessemer Retreat	34,760	57.21	.035	11.55	.44	.39	6.51
Non-Bess Retreat	81,547	56.57	.041	12.27	.66	.44	6.88
	847,470	56.59	.041	12.25	.65	.44	6.87
IHC Fines Concts	50,489	57.31	.033	12.92	.26	.55	9.21
MacKillican Retreat	488	53.68	.033	14.89	1.08	.30	7.69

c. Tonnage & Complete Analysis of Concentrates Shipped

Hawkins Concentrates	Tons	Iron	Phos	Silica	Mang	Alum	Lime	Mag	Sulfur	Ign Loss	Moist
Non-Bessemer	2,029	52.64	.072	16.67	.46	.55	.10	.10	.009	6.48	7.75
Bessemer Retreat	34,760	57.21	.035	11.55	.44	.39	.10	.10	.009	5.34	6.51
Non-Bessemer Retreat	748,013	56.57	.041	12.28	.66	.44	.10	.10	.009	5.14	6.87
Non-Bess Retreat S.P.	15,440	57.33	.038	11.21	.53	.42	.10	.10	.009	5.34	5.79
	800,242	56.61	.059	12.24	.65	.44	.10	.10	.009	5.10	6.84
MacKillican Retreat	488	53.68	.033	14.89	1.08	.30					7.69

d. Tonnage & Analysis of Ore in Inventory

Hawkins Concentrates	Tons	Iron	Phos	Silica	Mang	Alum	Moisture
Wash	134	50.50	.074	20.00	.35	.76	7.20
Retreat	62,534	56.60	.042	12.18	.70	.45	6.99
	62,668	56.59	.042	12.20	.70	.45	6.99

4. ESTIMATE of ORE RESERVES

a. Developed Ore - Factors Used

Concentrates	Cubic Feet Per Ton	Rock Deduction	Per Cent Recovery
Wash	14	0	50
Retreat	14	0	35

b. Estimated Reserves

Hawkins Concentrates	Reserves 12-31-55	Mined 1956	Balance after Mining	Changed by Re-estimate	Reserves 12-31-56
SE-NE 31, 57-22					
Open Pit Wash	245,152		245,152		245,152
Open Pit Retreat	444,654	127,716	316,938		316,938
	689,806	127,716	562,090		562,090
NE-SE 31, 57-22					
Open Pit Wash	522,270	921	521,349		521,349
Open Pit Retreat	705,779	293,108	412,671		412,671
Underground Wash	21,372		21,372		21,372
	1,249,421	294,029	955,392		955,392
SW-NW 32, 57-22					
Open Pit Wash	101,947		101,947		101,947
Open Pit Retreat	682,734	362,784	319,950		319,950
Underground Wash	22,172		22,172		22,172
	806,853	362,784	444,069		444,069
NW-SW 32, 57-22					
Open Pit Wash	179,931	1,242	178,689	-45,473	133,216
Open Pit Retreat	16,226	61,699	-45,473	+45,473	
Underground Wash	368,814		368,814		368,814
	564,971	62,941	502,030		502,030
Total Hawkins					
Open Pit Wash	1,049,300	2,163	1,047,137	-45,473	1,001,664
Open Pit Retreat	1,849,393	845,307	1,004,086	+45,473	1,049,559
Underground Wash	412,358		412,358		412,358
	3,311,051	847,470	2,463,581		2,463,581

c. Estimated Analysis of Ore Reserves

Hawkins Concentrates	Tons	Iron	Phos	Silica
SE-NE 31, 57-22				
Bessemer Open Pit Wash	105,604	61.18	.027	9.49
Non-Bessemer Open Pit Wash	139,548	57.35	.062	9.54
Bessemer Underground Wash	316,938	59.31	.030	10.26
	562,090	59.17	.037	9.94
NE-SE 31, 57-22				
Bessemer Open Pit Wash	407,672	58.69	.028	10.25
Non-Bessemer Open Pit Wash	113,677	60.08	.060	9.97
Bessemer Open Pit Retreat	412,671	58.10	.031	10.76
Bessemer Underground Wash	21,372	57.19	.024	9.43
	955,392	58.56	.034	10.35
SW-NW 32, 57-22				
Bessemer Open Pit Wash	47,888	58.66	.030	10.27
Non-Bessemer Open Pit Wash	54,059	57.87	.054	9.61
Bessemer Open Pit Retreat	319,950	57.64	.029	10.39
Bessemer Underground Wash	15,315	56.41	.020	11.18
Non-Bessemer Underground Wash	6,857	56.37	.069	11.76
	444,069	57.72	.033	10.33
NW-SW 32, 57-22				
Bessemer Open Pit Wash	16,553	59.45	.035	9.36
Non-Bessemer Open Pit Wash	116,663	57.26	.062	10.18
Bessemer Underground Wash	239,323	58.32	.031	9.59
Non-Bessemer Underground Wash	129,491	56.99	.060	10.04
	502,030	57.76	.048	9.84
Bessemer Wash Open Pit	577,717	59.16	.028	10.09
Non-Bessemer Wash Open Pit	423,947	58.12	.061	9.84
Total Wash Open Pit	1,001,664	58.72	.042	9.97
Total Bessemer Retreat Open Pit	1,049,559	58.33	.030	10.50
Bessemer Wash Underground	276,010	58.13	.030	9.67
Non-Bessemer Wash Underground	136,348	56.96	.060	10.13
Total Wash Underground	412,358	57.74	.040	9.82
Total Hawkins Concentrates	2,463,581	58.39	.038	10.18

5. LABOR & WAGES

a. Comments

An ample labor supply existed during the year and very little turnover was experienced. The strike from July 1 to August 6 resulted in a wage increase of $0.075 per hour plus fringe benefits.

b. Comparative Statement of Production

Product	847,958 Tons Concentrates
Number of Shifts	3
Number of Hours	8
Average Number of Men Working	143
Average Wage Per Hour	$2.720
Product Per Man Per Day	36.03
Labor Cost Per Man Per Ton	$0.6149
Total Number of Days	129
Amount Paid for Labor	$521,406.34

6. GENERAL SURFACE

a. Building & Repairs

Only necessary repairs were made to mine buildings.

b. Roads — Only operation changes.

c. Power Lines

Pit power lines were relocated to make way for future stripping and better power distribution.

7. OPEN PIT

a. Stripping

Rock stripping along the east side of the pit, in progress on January 1, 1956, continued until February 9, 1956. Surface and rock stripping in the same area was resumed after ore operations on October 22, 1956, and continued after the close of the year.

Stripping operations were scheduled on a 3-shift, 5-day-per-week schedule using one shovel and seven trucks, and were stepped up to two shovels and twelve trucks on December 17, 1956.

Following is a tabulation showing stripping removed, manhours, and cost per yard for Hawkins stripping in 1956:

Stripping	Cubic Yards	Shifts	Yards Per Shift	Man-Hours	Cost Per Yard
Hawkins	662,682	192	3,451	52,180	$0.564
MacKillican	162,678	33	4,930	11,554	0.616
	825,360	225	3,668	63,734	$0.586

b. Open Pit Mining

The 1956 ore season began on April 16, and except for a strike period from July 1 to August 6, was conducted on a 3-shift, 6-day-per-week schedule. Ore was mined in most part from the north side of the pit using the east bank for grading.

With the Joy rotary drill in operation for the first two months of the season, it was possible to lower the east pit bottom 20 feet; this was not possible with the churn drills because of caving ground in wet holes.

Pit operations in general were satisfactory with very little downtime due to equipment delays.

Production from the pit was as follows:

Hawkins Crude

	Wash Plant				Pit						
	Shifts	+2" Rejects	Plant Crude	Tons Per Shift	Shifts	Screen Rock	Lean and Waste	Pit Rock	Pit Crude	Tons Per Shift	Cost Per Ton
Wash	1.0		3,782	3,782	1.0	363		33	4,178	4,178	$0.264
Retreat	379.5	2,934	2,335,675	6,155	391.5	261,256	8,248	87,644	2,692,823	6,878	0.264
	380.5	2,934	2,339,457	6,148	392.5	261,619	8,248	87,677	2,697,001	6,871	$0.264
MacKillican											
Retreat	1.5		6,117	4,078	1.5	891			7,008	4,672	$0.246

Hawkins-MacKillican Totals

	Wash Plant				Pit						
	Shifts	+2" Rejects	Plant Crude	Tons Per Shift	Shifts	Screen Rock	Lean and Waste	Pit Rock	Pit Crude	Tons Per Shift	Cost Per Ton
Wash	1.0		3,782	3,782	1.0	363		33	4,178	4,178	$0.264
Retreat	381.0	2,934	2,341,792	6,146	393.0	262,147	8,248	87,644	2,699,831	6,870	0.264
	382.0	2,934	2,345,574	6,140	394.0	262,510	8,248	87,677	2,704,009	6,863	$0.264

c. Pumping & Drainage

The pump discharge line was relocated from the east side of the pit to the conveyor line to make way for future development.

Approximately 1,500 gallons of water per minute were pumped from from the Hawkins mine.

d. General Pit Activities

Pit activity in the Hawkins was confined to mining of iron ore and removal of pit rock. There was no lean ore or waste movement of any consequence.

8. BENEFICIATION

a. Washing Plant

The plant operated on the same schedule as the pit. Despite a 3-shift, 6-day-per-week schedule, downtime in the plant was relatively minor.

The Simplicity secondary screens which were replaced last spring gave little trouble, thus eliminating the bearing and deck problems of the original screens.

A brief statement of delays and percentage of total operating time follows. These delays do not necessarily mean an interruption in production, as in most instances bypassing of these units was possible. Also, in delays of crude to the plant, the larger delays were caused by a full surge pile to the Heavy-Media plant and pit cleanup was conducted at this time.

Source of Delay	Hours	Per Cent	Per Cent of 3080.0 Working Hours
Out of Ore	49.28	23.22	1.60
Pit Screening Plant	5.66	2.67	0.18
Crude Ore Conveyor	16.25	7.66	0.53
Primary Screens	7.42	3.50	0.24
Rock Pocket	0.33	0.16	0.01
Scalp Rock Truck	0.33	0.16	0.01
Crusher Feed Conveyor	1.42	0.67	0.05
Crushers	2.16	1.02	0.07
Crusher Product Conveyor	8.17	3.85	0.26
Crusher Discharge Screens	2.83	1.33	0.09
Crusher Screen Undersize Pump	1.58	0.74	0.05
Secondary Screen	6.50	3.06	0.21
Surge Pile Conveyor	25.17	11.86	0.82
Surge Pile Full	17.08	8.05	0.55
Classifiers	5.83	2.75	0.19
Coarse Concentrate Conveyor	0.58	0.27	0.02
Fine Concentrate Conveyor	0.50	0.24	0.02
Stockpile Conveyor	3.00	1.41	0.10
Tailings Pump	6.08	2.86	0.20
Tailings Line	16.33	7.69	0.53
Miscellaneous Chutes & Launders	1.66	0.78	0.05
Plant Tieup	4.00	1.88	0.13
Electric Power	6.08	2.86	0.20
Air Compressor	2.17	1.02	0.07
Freezing Weather	21.83	10.29	0.71
	212.24	100.00	6.89

Recapitulation

Crude Ore Delays to Head of Mill	71.19	33.54	2.31
Freezing Weather	21.83	10.29	0.71
Ore Processing Delays	119.22	56.17	3.87
	212.24	100.00	6.89

b. Heavy-Media Plant

The Heavy-Media plant operated satisfactorily during the season with a minimum of downtime. Additional magnetic separator capacity installed last spring reduced media losses and increased the production rate. Delays were as follows:

Source of Delay	Hours	Per Cent	Per Cent of 3243.75 Working Hours
Out of Ore	68.80	23.30	2.12
Surge Pile Feeder	21.75	7.36	0.67
Heavy-Media Feed Conveyor	9.42	3.19	0.29
Feed Preparation Screen	29.05	9.84	0.89
Fine Heavy-Media Feed Conveyor	3.92	1.33	0.12
Akins Separator	4.95	1.68	0.15
Hardinge Separator	5.92	2.01	0.18
Coarse Concentrate Screen	14.17	4.80	0.44
Coarse Reject Screen	20.26	6.86	0.62
Fine Reject Screen	3.00	1.02	0.09
Coarse Concentrate Conveyor	12.75	4.32	0.39
Stockpile Conveyor	0.33	0.11	0.01
Reject Conveyor	6.50	2.20	0.20
Reject Pocket	1.18	0.40	0.04
Waiting for Rock Truck	1.26	0.43	0.04
Circulatory Media Pumps	6.00	2.03	0.18
Dirty Media Pumps	3.75	1.27	0.12
Magnet. Separator	17.25	5.84	0.53
Densifiers	0.92	0.31	0.03
Crockett Sands Pump	8.00	2.71	0.25
Crockett Sands Line	1.50	0.51	0.05
Miscellaneous Chutes & Launders	2.83	0.96	0.09
Bucket Elevator	1.00	0.34	0.03
Wash Plant Tailings Pump	3.33	1.13	0.10
Wash Plant Tailings Line	16.75	5.67	0.52
Charging Plant	8.00	2.71	0.25
Clear Water Supply	2.00	0.68	0.06
Electric Power	7.33	2.48	0.23
Air Compressor	1.25	0.42	0.04
Freezing Weather	12.08	4.09	0.37
	295.25	100.00	9.10

Recapitulation

Source of Delay	Hours	Per Cent	Per Cent of 2098.0 Working Hours
Ore to Head of Mill	99.97	33.86	3.08
Freezing Weather	12.08	4.09	0.37
Ore Processing Delays	183.20	62.05	5.65
	295.25	100.00	9.10

c. Cyclone Plant

Installation of the new wash and drain screens and construction of the conveyor for plant feed improved cyclone plant operations in 1956. Some delays were experienced with wet ore on the feed conveyor; however, this will be eliminated by moving the drain screen to the lower floor of the washing plant.

Cyclone delays are listed as follows:

Source of Delay	Hours	Per Cent	Per Cent of 2920.0 Working Hours
Out of Ore	30.58	8.13	1.05
Out of Ore-Processing Wash Ore	2.00	0.53	0.07
Feed Conveyor	32.30	8.59	1.11
Feed Dewatering Screens	8.63	2.29	0.30
Roll Feeders	4.50	1.20	0.15
Circulating Media Pumps	43.08	11.46	1.47
Cyclones	18.88	5.02	0.64
Float Drain & Wash Screens	24.70	6.57	0.85
Sink Drain & Wash Screens	19.01	5.05	0.65
Primary Sink Magnetic Separators	16.50	4.39	0.57
Secondary Sink Mag Separators	1.40	0.37	0.05
Primary Float Magnetic Separators	2.25	0.60	0.08
Sink Tramp Screens	9.80	2.61	0.34
Float Tramp Screen Feed Pump	11.00	2.93	0.38
Thickeners	6.50	1.73	0.22
Diaphragm Pumps	8.76	2.33	0.30
Media Return Pump	1.75	0.47	0.06
Concentrate Pump	2.50	0.67	0.09
Concentrate Pipeline	5.00	1.33	0.17
Concentrate Dewatering Classifier	18.25	4.85	0.62
Fine Concentrate Conveyor	8.00	2.13	0.27

Source of Delay	Hours	Per Cent	Per Cent of 2920.0 Working Hours
Washing Plant Tailings Pump	3.83	1.02	0.13
Washing Plant Tailing Line	16.75	4.46	0.57
Media Charging Pump	10.25	2.73	0.35
Fresh Water Pump	4.50	1.20	0.15
Fresh Water Pipeline	0.75	0.20	0.02
Electric Power	5.75	1.53	0.20
Coarse Spill from Washing Plant	19.50	5.19	0.67
Plant Chargeup and Tieup	13.70	3.64	0.47
Freezing Weather	25.50	6.78	0.87
	375.92	100.00	12.87

Recapitulation

Ore to Head of Mill	64.88	17.26	2.22
Freezing Weather	25.50	6.78	0.87
Ore Processing Delays	285.54	75.96	9.78
	375.92	100.00	12.87

d. International Harvester Tailings Basin Plant

The International Harvester tailings plant started operations on a 1-shift, 6-day-per-week schedule on May 1, 1956, and increased to a 2-shift, 6-day-per-week schedule after the strike on August 13. Operations were completed on October 17. No major delays were experienced and operations were satisfactory both as to grade and production.

111,408 tons of crude ore were processed to produce 50,489 tons of concentrates at an average weight recovery of 45.32 per cent.

Following is a summary of plant delays:

Source of Delay	Hours	Per Cent	Per Cent of 1352.0 Working Hours
Dragline	10.32	7.29	0.76
Move Screening Plant	12.17	8.59	0.90
Feeder-Screening Plant	2.42	1.71	0.18
Screen-Screening Plant	4.42	3.12	0.33
Trash Conveyor-Screening Plant	2.17	1.53	0.16
Miscellaneous-Screening Plant	0.67	0.47	0.05
Plant Feed Pump	7.84	5.53	0.58
Plant Feed Pipeline	19.42	13.71	1.44
Trash Screen	6.75	4.77	0.50
Trash Conveyor	0.17	0.12	0.01
Hydroseparator	1.50	1.06	0.11
Sizer Feed Lines	0.75	0.53	0.06
Concentrate Pump	5.00	3.53	0.37
Miscellaneous Chutes & Launders	1.25	0.88	0.09
Railroad Cars & Tracks	20.42	14.42	1.51
Clear Water Pump	6.25	4.41	0.46
Clear Water Line	3.00	2.12	0.22
Electric Power	2.67	1.88	0.20
Plant Tieup and Startup	34.47	24.33	2.55
	141.66	100.00	10.48

Recapitulation

Ore to Head of Mill	59.43	41.95	4.40
Ore Processing Delays	82.23	58.05	6.08
	141.66	100.00	10.48

Note: Delays include all repairs to the plant during the operating season. Very few repair shifts were worked.

e. Complete Concentration Data for 1956

Concentrating data for the Hawkins wash and retreat plants and for the tailings basin plant is shown as follows:

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Hawkins Wash Plant Product	Tons	Per Cent Weight Plant	Per Cent Weight Pit	Per Cent Iron	Per Cent Phos	Per Cent Silica	Per Cent Units
Crude to Plant	3,782	100.00	90.52	43.30		34.26	
Pit Rock	22		.79	30.10		50.70	
Screen Plant Rock	363		8.69	27.65		55.55	
Pit Crude	4,178		100.00	41.84		36.24	
Total Concentrates	2,163	57.19	51.77	52.45	.072	16.98	69.28
Total Concentrates Produced and Shipped	2,163	57.19	51.77	52.45	.072	16.98	69.28
Total Fine Tailings (by difference)	1,619	42.81	38.75	31.07		57.35	
Hawkins Retreat Plant Product							
Crude to Plant	2,335,675	100.00	87.00	40.48		37.00	
Pit Rock	87,644		3.26	25.05		59.14	
Screen Plant Rock	261,256		9.74	24.26		60.46	
Pit Crude	2,684,575		100.00	38.40		40.01	
Total Concentrates	845,307	36.19	31.49	56.59	.040	12.28	50.59
Total Concentrates Produced & Shipped	845,307	36.19	31.49	56.59	.040	12.28	50.59
Heavy-Media Concentrates	546,049	23.38	20.34	57.02		11.47	
Heavy-Media Rejects	310,318	13.28	11.56	42.57		33.16	
Heavy-Media Feed	856,367	36.66	31.90	51.78		19.33	
-2" Wash Plant Rejects	2,934	.13	.11	25.70		58.20	
Total Fine Tailings (by difference)	1,177,116	50.40	43.85	28.39		55.71	
MacKillican Retreat							
Crude to Plant	6,117	100.00	87.29	27.10		55.60	
Screen Plant Rock	891		12.71	19.00		67.70	
Pit Crude	7,008		100.00	26.07		57.14	
Total Concentrates	488	7.98	6.96	53.68	.033	14.89	15.79
Total Concentrates Produced & Shipped	488	7.98	6.96	53.68	.033	14.89	15.79
Heavy-Media Concentrates	314	5.13	4.48	56.30		11.27	
Heavy-Media Rejects	992	16.22	14.16	37.70		39.47	
Heavy-Media Feed	1,306	21.35	18.64	42.17		36.29	
Total Fine Tailings (by difference)	4,637	75.80	66.17	22.03		63.34	

Total Retreat Product	Tons	Per Cent Weight Plant	Per Cent Weight Pit	Per Cent Iron	Per Cent Phos	Per Cent Silica	Per Cent Units
Crude to Plant	2,341,792	100.00	87.00	40.44		37.04	
Pit Rock	87,644		3.26	25.05		59.14	
Screen Plant Rock	262,147		9.74	24.24		60.48	
Pit Crude	2,691,583		100.00	38.36		40.04	
Total Concentrates	845,795	36.12	31.42	56.59	.040	12.28	50.54
Total Concentrates Produced & Shipped	845,795	36.12	31.42	56.59	.040	12.28	50.54
Heavy-Media Concentrates	546,363	23.33	20.30	57.02		11.47	
Heavy-Media Rejects	311,310	13.29	11.56	42.55		33.18	
Heavy-Media Feed	857,673	36.62	31.86	51.77		19.35	
-2" Wash Plant Rejects	2,934	.13	.11	25.70		58.20	
Total Fine Tailings (by difference)	1,181,753	50.46	43.91	28.36		55.74	
Tailings Basin Plant							
Crude to Plant	111,408	100.00		45.33		31.01	
Total Concentrates	50,489	45.32		57.33	.032	12.92	57.31
Total Fine Tailings (by difference)	60,919	54.68		35.39		45.99	

9. MAINTENANCE & REPAIRS

Repairs to pit equipment were carried on throughout the operation season to eliminate high Winter & Idle charges. The concentrating plant did not have the advantage of a third repair shift so that considerable repair work will be done during the fall and winter season.

10. COST of OPERATIONS

a. Comparative Mining Costs - Hawkins & MacKillican Combined

Product	1956 Estimate	1956 Production	1955 Production
Wash Concentrates	921	2,163	53,058
Per Cent Recovery	51.31	52.18	55.63
Retreat Concentrates	849,079	845,795	855,990
Per Cent Recovery	30.97	32.48	33.07
Total Production	850,000	847,958	909,048
Stockpile Overrun			5,841
Grand Total Production	850,000	847,958	914,889

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Product	1956 Estimate	1956 Production	1955 Production
Average Daily Output	6,170	6,573	6,137
Tons Per Man Per Day		36.03	36.22
Days Operated	135	129	153
Fine Ore Plant			
Concentrates	50,000	50,489	56,954
Per Cent Recovery	39.00	45.32	32.31
Average Daily Output	410	447	500
Tons Per Man Per Day		47.10	20.62
Days Operated	122	113	114
Costs			
Total Pit Operating	$0.280	$0.264	$0.259
Total Concentrating	0.221	0.211	0.196
Loading Stockpiled Ore	0.006	0.007	0.009
Miscellaneous Pit & Beneficiation	0.110	0.116	0.092
Total General Mine Expense	0.136	0.123	0.126
Winter & Idle Expense	0.372	0.395	0.259
Cost of Production	$2.198	$2.068	$1.783
Depreciation			
Plant & Equipment		0.252	0.227
Motorized & Other Equipment		0.032	0.053
Movable Equipment		0.008	0.005
Amortization			
Stripping		-0.005	0.001
Taxes			
Ad Valorem		0.152	0.249
Occupational		0.171	0.163
Royalty		0.188	0.135
Total: Depreciation-Amortization-Taxes		0.798	0.791
Administrative Expense		0.050	0.045
Miscellaneous Expense & Income		0.001	-0.004
Royalty		1.378	1.105
Grand Total Cost at Mine		$4.295	$3.720

b. Detailed Cost Comparison

Pit Costs were below the budget by $0.016 but higher than 1955 costs by $0.005 due to higher labor costs.

Concentrating Costs compared favorably with the budget although higher than 1955 by $0.015. Considerable overtime to meet ore requirements was necessary due to the strike.

Loading Stockpile showed only a slight difference between the budget and 1955 costs.

Miscellaneous Pit & Beneficiation Costs were higher because of necessary changes to power and pipe lines for future stripping.

General Mine Expense compared favorably with the budget and 1955 expense.

Winter & Idle was higher in 1956 because of a higher production rate in 1955 and 1956.

Cost of Production was below the budget but higher than 1955 costs because of reasons mentioned above and because of lower recovery ore being treated.

11. EXPLORATION & FUTURE EXPLORATION None

12. TAXES

	1956		1955		Increase-Decrease	
Real Estate	Assessed Value	Taxes	Assessed Value	Taxes	Assessed Value	Taxes
Mineral	$334,996	$110,642.48	$463,015	$152,827.36	-$128,019	-$42,184.88
Lands,Bldg,Machinery	130,902	42,516.75	110,275	35,589.02	20,627	6,927.73
IHC Basin Lands,Plant	11,197	2,871.82	11,197	2,763.63		108.19
Personal Property						
Equipment	103,012	34,022.80	113,297	37,296.04	- 10,285	- 3,273.24
Stockpile	422	139.38	5,207	1,718.67	- 4,785	- 1,579.29
	$580,529	$190,193.23	$702,991	$230,194.72	-$122,462	-$40,001.49
Average Mill Rate		327.62		327.45		.17

Mineral tax decreased by reduction in reserve tonnage from production and revaluation under Recovery Law from 47 per cent of full and true value to 39.5 per cent of full and true value, more than offsetting a 5 per cent increase by the State on mineral values.

State increased all buildings in Nashwauk by 25 per cent and concentrating plant set up at 40 per cent of full and true, over 33-1/3 per cent of full and true in 1955. IHC lands and plant increase of 3.91 per cent in mill for Lone Pine Township.

Personal property—equipment decreased by normal depreciation.

13. ACCIDENTS & PERSONAL INJURY

Name	Injury Date	Injury Nature	Cause	Time Lost Weeks	Time Lost Days	Compensation Paid
William Lehto	1-20	Contusion back and right knee. Fracture T-11, T-12. Compression vertebrae.	Left truck either in reverse gear or was pulled in gear after truck box was partially raised. Truck backed over dump, remaining upright. Lehto stayed in truck.	11	0	$440 plus 20% disability for total of $2640.
Charles Hogback	5-4	Sprained right ankle.	Apparently dozed off while driving load of rock to dump. Seeing truck so near edge of road, driver jumped off, spraining ankle.	1	2	$13.33
Mike Benjamin	10-31	Laceration base left thumb nail and across half of pulp. Suspect fracture of tip.	In moving large pump motor from plant, Benjamin placed blocking under motor to level it up as they were going to move chain block to another place. Had left thumb on top of blocking when motor was let down, catching thumb between motor and blocking.	3	2	$136

14. PROPOSED NEW CONSTRUCTION — None

15. EQUIPMENT & PROPOSED NEW EQUIPMENT

a. Equipment Received

1	Grader
2	34-ton Euclid Trucks
1	60-HW Joy Rotary Drill
2	6x20 Washing Plant Screens
2	6x16 Cyclone Plant Screens
1	Pickup Truck

b. Proposed New Equipment

1	Pickup Truck
1	TD-24 Tractor
1	6x20 Screen for 1/4" Split
1	Service Truck
1	34-ton Euclid Truck
1	Tailings Pump

HILL-TRUMBULL MINE

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1. GENERAL

Upon completion of the 1955 stripping program on December 31, 1955, mine activity was confined to dike and bridge construction and to pit and plant repairs.

Dike work, started on January 3 and completed January 20, consisted of raising the dike an average of 10 feet. A 3-shift, 5-day-week schedule was maintained from January 3 to January 14, and a 2-shift schedule from January 16 through January 20. One shovel and three trucks per shift placed a total of 62,232 cubic yards of fill on the dike.

The repair and maintenance program covered the following: repairs to pit conveyors, screening plant, and timbering at the lower end of the pit tunnel; mine shop repairs covered shovels, drills, locomotives, haulage cars, and miscellaneous equipment; truck shop repairs covered trucks, tractors, and graders; and general repairs covering the washing, retreat, and cyclone plants began in the fall of 1955 and continued through the winter and spring.

Due to the relocation of Highway 169, the railroad bridge used to haul crude ore to the plant had to be moved 8 feet south and raised 12 inches. The Minnesota Highway Department paid 50 per cent of the cost for construction of the new bridge.

A Kidde CO_2 fire extinguishing system was installed in the transfer stations of the pit conveyor tunnel.

Installation of a separate bin and track system for fines loading was completed for the 1956 ore season.

Although stockpiles had a small tonnage of overrun, no stockpile loading was necessary in the spring of 1956 until after the plants had started to operate.

Ore production began on April 16 on a 2-shift, 6-day-week schedule which continued through the entire ore season. Two to three shovels in ore serviced by eight to ten trucks produced 2,155,131 tons of crude wash and retreat ores which yielded 638,209 tons of concentrates. Shift production of crude ore averaged 7,588 tons at a recovery of 28.98 per cent, or 2.02 per cent above the 1955 recovery of 26.96 per cent.

Because of the general strike of the United Steelworkers of America (CIO), operations were terminated at 11:00 pm on June 30. All mobile equipment was spaced out for fire protection; shovels were moved clear of the banks; and plants were cleaned out properly. Notice was received on the afternoon of August 6 of the termination of the strike; all men were recalled on August 7; and loading of ore was resumed immediately.

200,728 tons of wash ore were mined from a thin cretaceous layer on the north side of the Hill-Walker lease and from the south property line of the Trumbull lease. Shift production of washed concentrates averaged 3,876 tons at a recovery of 54.68 per cent, for a 0.44 per cent recovery above the 1955 recovery of 54.24 per cent. Tonnages produced and concentrates yielded are shown as follows:

Property	Material	Tons Produced	Concentrates Yielded
Hill-Walker	Wash Crude	124,963	70,958
Trumbull	Wash Crude	75,765	43,304
Hill Overrun	Wash Crude		70
		200,728	114,332

1,954,403 tons of retreat crude were mined from the following areas:

a. West, north, east, and a minor amount from the south side of the Hill-Walker.

b. Southeast corner of the Potter.

c. North side of the Hill and scram area.

d. North side and center of the Gross-Marble.

e. South central and southeast corner of the Trumbull lease.

Shift production of retreat concentrates averaged 2,058 tons at an average recovery of 26.34 per cent. Tonnages produced and concentrates yielded are shown as follows:

Property	Material	Tons Produced	Concentrates Yielded
Hill-Walker	Retreat Crude	296,179	72,935
Hill	Retreat & Scram	598,286	150,992
Trumbull	Retreat Crude	441,543	129,940
Potter	Retreat Crude	69,972	11,517
Gross-Marble	Retreat Crude	548,423	158,493
		1,954,403	523,877

A railroad car shortage necessitated the stockpiling of 143,222 tons of concentrates during the season.

Following the close of mining operations, plant and conveyor systems were cleaned out and crews were shifted to stripping, equipment repairs, and plant repairs.

The stripping program involved the removal of surface and transfer of rock from the following areas:

a. North, east, and south side of the Hill-Walker.

b. Southeast corner of the Potter.

c. Trumbull: southwest corner and the north side to expose ore along the south side of the Hill-Walker.

d. Transfer of Hill-Trumbull pit rock dump to rock dump north of pit.

Stockpile loading was not necessary after completion of the ore season. 83,285 tons of concentrates remained in stockpile at the end of the year.

On November 12, a limited drilling program was started in the Hill-Walker lease to re-estimate the reserves for setting minimums in 1957.

2. PRODUCTION-SHIPMENTS-INVENTORIES

a. Production by Grades

Crude to Plant	Line	Wash	Retreat	Total
Hill			529,226	529,226
Gross-Marble			500,153	500,153
Trumbull	75,615		392,673	468,288
Hill-Walker		114,493	254,359	368,852
Potter			47,742	47,742
	75,615	114,493	1,724,153	1,914,261

Concentrates	Bessemer	Non Bessemer	Total
Hill	70		70
Hill Retreat	30,779	120,213	150,992
Hill-Walker Wash	14,319	56,639	70,958
Hill-Walker Retreat	7,537	65,398	72,935
Trumbull Line	17,111	26,193	43,304
Trumbull Retreat	53,128	76,812	129,940
Potter Retreat	898	10,619	11,517
Gross-Marble Retreat	45,404	113,089	158,493
	169,246	468,963	638,209

b. Shipments

Hill	70		70
Hill Retreat	30,779	120,213	150,992
Hill-Walker Wash	14,319	47,076	61,395
Hill-Walker Retreat	5,102	58,086	63,188
Trumbull Line	12,521	21,623	34,144
Trumbull Retreat	25,718	49,407	75,125
Potter Retreat	898	10,619	11,517
Gross-Marble Retreat	45,404	113,089	158,493
	134,811	420,113	554,924

c. Stockpile Inventories

Concentrates	Bessemer	Non Bessemer	Total
Trumbull Wash	4,590	4,570	9,160
Trumbull Retreat	27,410	27,405	54,815
Hill-Walker Wash		9,563	9,563
Hill-Walker Retreat	2,435	7,312	9,747
	34,435	48,850	83,285

d. Production by Months

Crude Ore

Month	Hill Wash	Hill Retreat	Trumbull Retreat	Trumbull Line	Walker Wash	Walker Retreat	Gross Marble	Potter	Total
Apr			3,847				161,841		165,688
May		58,709					338,312		397,021
June		356,702							356,702
Aug		113,815			65,895	117,818			297,528
Sept			103,791	19,642	48,598	136,541			308,572
Oct			285,035	55,973				47,742	388,750
		529,226	392,673	75,615	114,493	254,359	500,153	47,742	1,914,261

Concentrates

Month	Hill Wash	Hill Retreat	Trumbull Retreat	Trumbull Line	Walker Wash	Walker Retreat	Gross Marble	Potter	Total
Apr	70	4,994	4,425	4,508		309	51,406		65,712
May		16,025					104,785		120,810
June		96,091					2,302		98,393
July		216							216
Aug		33,666			40,709	31,739			106,114
Sept			32,291	9,164	30,249	40,887			112,591
Oct			89,944	29,255				11,517	130,716
Nov			3,280	377					3,657
	70	150,992	129,940	43,304	70,958	72,935	158,493	11,517	638,209

3. ANALYSIS

a. Crude Ore

Product	Tons	Iron	Silica
Hill Retreat	529,226	36.90	43.15
Gross-Marble Retreat	500,153	37.53	42.22
Trumbull Line	75,615	38.65	40.02
Trumbull Retreat	392,673	35.75	44.92
Hill-Walker Wash	114,493	48.94	26.36
Hill-Walker Retreat	254,359	40.81	38.17
Potter Retreat	47,742	38.58	40.91
	1,914,261	~~38.08~~ 38.18	41.42

b. Tonnage & Analysis of Concentrates Produced

Product	Tons	Iron	Phos	Silica	Mang	Alum	Moisture
Hill Bessemer	70	55.80	.039	13.80	.16	.40	5.80
Hill Bessemer Retreat	30,779	57.95	.044	11.00	.13	.46	6.52
Hill Non Bessemer Retreat	120,213	58.00	.046	10.80	.14	.49	6.41
Hill-Walker Bessemer Wash	14,319	58.34	.045	12.00	.17	.82	11.48
Hill-Walker Non Bessemer Wash	56,639	58.25	.047	12.09	.15	.91	10.99
Hill-Walker Bessemer Retreat	7,537	59.32	.051	10.64	.16	.89	9.67
Hill-Walker Non Bessemer Retreat	65,398	59.77	.053	9.98	.16	.96	9.65
Trumbull Bessemer Line	17,111	56.66	.042	11.52	.15	.48	8.61
Trumbull Non Bessemer Line	26,193	56.51	.052	11.86	.15	.49	9.85
Trumbull Bessemer Retreat	53,128	56.43	.043	12.46	.14	.45	6.41
Trumbull Non Bessemer Retreat	76,812	56.70	.045	12.01	.14	.47	6.57
Potter Bessemer Retreat	898	55.77	.038	14.41	.14	.36	6.83
Potter Non Bessemer Retreat	10,619	55.08	.044	15.45	.14	.47	6.90
Gross-Marble Bessemer Retreat	45,404	58.48	.044	9.63	.13	.42	5.92
Gross-Marble Non Bess Retreat	113,089	58.27	.046	9.88	.15	.40	5.81
	638,209	57.88	.045	~~10.89~~ 11.05	.15	.55	7.39

c. Tonnage & Complete Analysis of Concentrates Shipped

Product	Tons	Iron	Phos	Sil	Mang	Alum	Lime	Mag	Sulf	Ign Loss	Moist
Hill Bessemer Wash	70	55.80	.039	13.80	.16	.40	.10	.15	.007	5.44	5.80
Hill Bessemer Retreat	30,779	57.95	.044	11.00	.13	.46	.10	.15	.007	5.14	6.52
Hill Non Bess Retreat	120,213	58.00	.046	10.80	.14	.49	.10	.15	.007	5.22	6.41
Hill-Walker Bess Wash	14,319	58.34	.045	12.00	.17	.82	.11	.15	.008	3.15	11.48
Hill-Walker Non Bess Wash	47,076	58.11	.047	12.28	.15	.91	.11	.15	.008	3.13	11.01
Hill-Walker Bess Retreat	5,102	59.24	.050	10.71	.16	.88	.10	.15	.008	3.11	9.57
Hill-Walker N.B. Retreat	58,086	59.80	.053	9.92	.16	.96	.10	.15	.008	3.01	9.62
Trumbull Bessemer Line	12,521	56.64	.041	11.71	.15	.48	.10	.15	.007	6.26	8.13
Trumbull Non Bessemer Line	21,623	56.47	.053	12.04	.15	.48	.10	.15	.007	6.15	9.84
Trumbull Bessemer Retreat	25,718	56.22	.040	12.80	.14	.45	.11	.16	.007	5.80	6.05
Trumbull Non Bess Retreat	49,407	56.74	.045	11.94	.14	.47	.11	.16	.007	5.88	6.46
Potter Bessemer Retreat	898	55.77	.044	15.45	.14	.47	.10	.16	.008	4.76	6.83
Potter Non Bess Retreat	10,619	55.08	.044	15.45	.14	.47	.10	.16	.008	4.76	6.90
Gross-Marble Bess Retreat	45,404	58.48	.044	9.63	.13	.42	.10	.15	.007	5.79	5.92
Gross-Marble N.B. Retreat	113,089	58.27	.046	9.88	.15	.40	.10	.15	.007	5.83	5.81
	554,924	57.96	.046	10.95	.15	.55	.10	.15	.007	5.05	7.31

d. Mine Analysis of Ore in Stockpile

Product	Tons	Iron	Phos	Silica	Mang	Alum	Moisture
Trumbull Wash	9,160	56.72	.045	11.02	.16	.52	9.91
Trumbull Retreat	54,815	56.62	.045	12.15	.14	.46	6.75
Hill-Walker Wash	9,563	58.91	.048	11.15	.16	.90	10.91
Hill-Walker Retreat	9,747	59.50	.052	10.48	.16	.90	9.87
	83,285	~~57.34~~	~~.041~~	~~10.46~~	~~.15~~	.57	7.94
		57.73	.044	11.77 ✓	.14	✓	✓

4. ESTIMATE of ORE RESERVES

a. Developed Ore - Factors Used

Product	Cubic Feet Per Ton	Rock Deduction	Per Cent Recovery
Hill-Trumbull Merch	14	0	100
Hill-Trumbull Wash	14	0	54
Hill-Trumbull Retreat	14	0	30
Hill-Walker Wash	14	0	59
Hill-Walker Retreat	14	0	33
Potter Retreat	14	0	28
Gross-Marble Wash	14	0	54
Gross-Marble Retreat	14	0	30

b. Ore Reserves Estimated as of December 31, 1956

Lease	Reserve 12-31-55	Mined 1956	Balance after Mining	Changed by Re-estimate	Reserve 12-31-56
Trumbull	1,588,630	173,245	1,415,385		1,415,385
Hill	1,113,610	151,062	962,548		962,548
Hill-Walker	624,414	143,893	480,521		480,521
Potter	85,471	11,517	73,954		73,954
Gross-Marble	1,514,391	158,492	1,355,899		1,355,899
	4,926,516	638,209	4,288,307		4,288,307

c. Estimated Analyses of Ore Reserves

	Tons	Iron	Phos	Silica	Mang	Alum
Trumbull						
Bessemer Wash Concentrates	17,575	57.61	.037	9.63	.10	.39
Non Bessemer Wash Concentrates	143,826	58.23	.053	9.70	.11	.54
Bessemer Retreat Concentrates	188,170	57.67	.036	10.72		
Non Bessemer Retreat Concentrates	1,065,814	57.64	.056	10.68		
	1,415,385	57.70	.053	10.57	.11	.54

c. Estimated Analyses of Ore Reserves (con't)

	Tons	Iron	Phos	Silica	Mang	Alum
Hill						
Non Bessemer Direct	63,317	60.05	.063	8.82		
Bessemer Wash Concentrates	264,860	62.38	.028	9.25	.11	.47
Non Bessemer Wash Concentrates	78,361	60.14	.053	10.74	.12	.36
Bessemer Retreat Concentrates	377,432	60.29	.034	10.56		
Non Bess Retreat Concentrates	178,578	59.69	.051	10.48		
	962,548	60.73	.039	10.08	.11	.45
Hill-Walker						
Non Bessemer Wash Concentrates	20,813	59.50	.045	11.30		
Non Bess Retreat Concentrates	459,708	55.48	.051	13.48		
	480,521	55.65	.051	13.39		
Potter						
Non Bess Retreat Concentrates	73,954	56.62	.060	12.85		
Gross-Marble						
Bessemer Wash Concentrates	127,902	57.61	.037	9.63	.10	.39
Non Bessemer Wash Concentrates	670,552	58.25	.053	9.73	.11	.56
Bessemer Retreat Concentrates	260,840	57.66	.036	10.70		
Non Bess Retreat Concentrates	296,605	57.63	.055	10.67		
	1,355,899	57.94	.049	10.11	.11	.53
Total Direct Ore	63,317	60.05	.063	8.82		
Bessemer Wash Concentrates	410,337	60.70	.031	9.38	.10	.44
Non Bessemer Wash Concentrates	913,552	58.44	.053	9.85	.11	.54
Total Wash Concentrates	1,323,889	59.14	.046	9.70	.11	.51
Bessemer Retreat Concentrates	826,442	58.86	.035	10.64		
Non Bess Retreat Concentrates	2,074,659	57.30	.056	11.36		
Total Retreat Concentrates	2,901,101	57.74	.050	11.15		
Total Bessemer Concentrates	1,236,779	59.47	.034	10.22	.10	.44
Total Non Bess Concentrates	3,051,528	57.70	.055	10.86	.11	.54
Total Hill-Trumbull Mine	4,288,307	58.21	.049	10.68	.11	.52

5. LABOR & WAGES

a. Comments

An ample labor supply prevailed in 1956. Replacements of a few men not returning to work or retiring were made from the Hawkins mine layoff list.

A general steelworkers' strike for wage increases, supplemental unemployment benefits, and additional fringe benefits lasted from June 30 to August 6 and resulted in the complete shutdown of the mine during that period. There were no other labor disturbances. Company-union relations continued on a satisfactory basis.

b. Comparative Statement of Production and Wages

Product	638,209
Number of 8-hour shifts	2
Average number of men working	168
Average wages per day	$21.76
Product per man per day	27.02
Labor cost per ton	$0.818
Total number of days worked	141
Amount paid for labor	$521,875.15

6. GENERAL SURFACE

a. Building and Repairs

Resheeting of the washing plant, started by Western-Knapp Engineering Company late in November, was approximately 50 per cent complete by the end of the year. This project is scheduled for completion by the 1957 ore season.

Houses and other buildings were repaired and painted as required.

b. Roads, Transmission Lines, Tracks & Construction

No major road changes were made during the year. Approval was given to the Oliver Iron Mining Division to build roads through the Hill and Trumbull leases to be used to haul Delaware #1 ore from the mine to the screening plant serving the Oliver plant and located on the Gross-Marble lease.

Power lines to the Hill lease, over the Delaware #1, were removed and a power line was installed from the Trumbull lease to the Hill lease. Future mining in the Delaware will necessitate a major power line change in a few years.

A normal track repair program was carried on throughout the ore season.

The bridge over Highway 169 was completed for the start of the ore season. 50 per cent of the cost of the new bridge was paid by the Minnesota State Highway Department.

7. OPEN PIT

a. Stripping

No stripping was in progress at the start of the 1956 season; and no cleanup was necessary at the start of the ore season.

Following the close of mining operations on October 31, two shovels were moved into the Hill-Walker lease and one into the Potter for stripping. A standby shovel was in location for breakdowns. Four crews worked on a 40-hour, 20-shift-per-week schedule throughout the stripping program. The Hill-Walker program consisted of stripping the north, east, and south sides; the Potter program consisted of stripping to widen the existing area to the north. Upon completion of the Hill-Walker and Potter stripping programs, the shovels were moved to the Trumbull, stripping the southwest corner to widen the approach to the Potter, and stripping the north side of the Trumbull dump to release Hill-Walker ore to the south property line. A small yardage of rock was transferred from the Hill-Trumbull rock dump located in the Hill pit to the rock dump north of the pit. Stripping and rock removal was completed on December 1 with a total of 507,325 cubic yards of material stripped.

Shift production averaged 6,263 cubic yards at an average cost of $0.221 per yard, $0.077 below the budget.

Stripping removed in 1956 is shown as follows:

Lease	Cubic Yards		
	Surface	Rock	Total
Hill-Walker	310,913		310,913
Potter	26,741		26,741
Trumbull	168,295		168,295
Hill-Trumbull Rock Dump		1,376	1,376
	505,949	1,376	507,325

b. Open Pit Mining

The 1956 ore season started on April 16 on a 2-shift, 6-day week schedule which was maintained until the end of ore season on October 31. Two to three shovels and eight to ten trucks were used under normal operating conditions.

2,155,131 tons of crude ore were produced in 142 days at an average rate of 7,588 tons per shift. From this crude ore 240,870 tons of -4" waste rock were screened out in the pit, and the balance of 1,914,261 tons was sent to the plants at an average rate of 6,740 tons per shift.

Screen rock made up 11.18 per cent of the total crude, 5.29 per cent of the wash crude, and 11.78 per cent of the retreat. Rock percentage in wash ore increased 4.49 per cent above the previous year; decreased 3.24 per cent in retreat ore; giving a combined decrease of 3.25 per cent over the 1955 season. The combined decrease was due to the increased percentage of wash ore mined over the previous year.

As in the past several years, retreat crude ore made up a major portion of the pit production, totalling 1,954,403 tons as compared with 200,728 tons of washed crude ore.

Following is the tonnage produced from the various leases:

Lease	Retreat Ore	Area From Which Produced
Hill-Walker	296,179	By enlarging pit on all sides
Hill	598,286	North side and scram area
Trumbull	441,543	Southcentral and southeast corner
Potter	69,972	Southeast corner
Gross-Marble	548,423	Center and north side

Wash ore was produced from a thin cretaceous layer on the north side of the Hill-Walker lease and from the south property line of the Trumbull lease.

During mining operations, rock too large to pass through the screening plant was sorted and loaded out at the shovel. This pit rock amounted to 111,600 tons which when combined with 33,156 tons of sand and waste cleanup gave a total of 144,756 tons of waste material moved from the mine during the operating season.

Mining conditions during the 1956 operating season were generally satisfactory and normal with only a few heavy rains and average equipment breakdowns.

c. Pumping and Drainage

The main pit pumping remained the same as the previous year. The Oliver Iron Mining Division did not work the Delaware #2 until late in the season, thus the Hill-Trumbull did most of the pumping. During the strike, pumping was discontinued from July 28 to August 7. The Oliver continued pumping the Gross-Marble throughout the entire season.

Intermittent pumping was done from the lower ditch to the upper ditch in the Hill-Walker pit area. Pumping and drainage cost was $0.002 per ton of crude ore.

d. General Pit Activity

Pit activity during the year consisted of surface stripping, transfer of rock dump, mining, and some scramming. Except for pit rock and sand cleanup, there was no movement of waste or lean ore.

8. BENEFICIATION

a. Washing Plant

The washing plant was started on April 16 on a 2-shift, 6-day-week schedule which remained in effect until the close of operations on October 31.

During the season, the washing plant operated 285 shifts and treated 190,108 tons of wash ore crude and 1,724,153 tons of retreat crude ore for a total of 1,914,261 tons. The plant produced 109,754 tons of washed concentrates at an average net recovery of 57.73 per cent and 817,980 tons of Heavy-Media feed at an average recovery of 47.44 per cent. The scalped /2" material amounted to 9.28 per cent of the retreat crude, almost the same as last year. The net feed rate of crude to the washing plant averaged 870.15 tons per hour, down slightly from the previous season due to the low production rate from the Potter lease. Delay time to the washing plant in 1956 was under that of 1955.

Following is a brief summary of delay time to the washing plant:

Source of Delay	Hours	Per Cent	Per Cent of 2280.0 Working Hours
Out of Ore	36.25	45.26	1.59
Crude Ore Pocket	2.25	2.81	0.10
8' Pan Conveyor	3.91	4.88	0.17
Crude Conveyor	1.50	1.87	0.07
Primary Screens	1.42	1.77	0.06
Scalp Rock Pocket	0.50	0.63	0.02
Waiting for Rock Truck	0.25	0.31	0.01
Crushers	2.00	2.50	0.09
Crusher Discharge Screen	0.92	1.15	0.04
Secondary Screens	2.09	2.61	0.09
Surge Pile Feed Belt	2.75	3.43	0.12
Classifiers	2.83	3.53	0.13
Tailings Line	4.17	5.21	0.18
Electric Power	0.83	1.04	0.04
Misc. Chutes & Launders	0.50	0.63	0.02
Changing Ore	0.50	0.62	0.02
Plant Tieup	2.75	3.43	0.12
Freezing Weather	14.67	18.32	0.64
	80.09	100.00	3.51

Source of Delay	Hours	Per Cent	Per Cent of 2280.0 Working Hours
Recapitulation			
Ore to Head of Mill	43.91	54.82	1.93
Freezing Weather	14.67	18.32	0.64
Ore Processing Delays	21.51	26.86	0.94
	80.09	100.00	3.51

b. Heavy-Media Plant

The Heavy-Media plant began operations on April 16 on the same schedule as the washing plant, operating on feed from the surge pile during periods when the washing plant was down for repairs or when processing wash ore.

From 817,980 tons of feed, 400,366 tons of Heavy-Media concentrates were produced at an average weight recovery of 48.95 per cent. 1,724,153 tons of retreat crude delivered to the washing plant produced 514,869 tons of retreat concentrates at an average weight recovery of 29.86 per cent.

The over-all grade of Heavy-Media and total retreat concentrates was about the same as that of the previous year and held to the estimated grade very closely. As in the past seasons, finer crushing, scalping of the lean -2" material, and improved cyclone plant operation resulted in a concentrate grade within the pre-season estimate.

There were no major mechanical delays in the Heavy-Media plant during the season, and the over-all delay time was just over half that of the previous year. Following is a brief summary of delay time:

Source of Delay	Hours	Per Cent	Per Cent of 2098.0 Working Hours
Out of Ore	2.42	6.54	0.12
Coarse Concentrates Wash Screen	0.50	1.35	0.02
Heavy-Density Concentrate Conveyor	1.91	5.16	0.09
Rock Pocket	0.67	1.81	0.03
Circulating Media Pump	1.50	4.06	0.07

Source of Delay	Hours	Per Cent	Per Cent of 2098.0 Working Hours
35' Thickener	1.00	2.70	0.05
Electric Power	0.50	1.35	0.02
Weekend Tieup	12.50	33.79	0.60
Freezing Weather	16.00	43.24	0.76
	37.00	100.00	1.76
Recapitulation			
Ore to Head of Mill	2.42	6.54	0.12
Freezing Weather	16.00	43.24	0.76
Ore Processing Delays	18.58	50.22	0.88
	37.00	100.00	1.76

Concentrating data for the washing and Heavy-Media plants is shown as follows:

Washing Plant Product	Tons	Per Cent Weight Plant	Per Cent Weight Pit	Per Cent Iron	Per Cent Phos	Per Cent Silica	Per Cent Iron Units*
Crude to Plant	190,108	100.00	94.71	44.85		31.81	
Pit Rock							
Screen Plant Rock	10,620		5.29	26.96		56.57	
Pit Crude	200,728		100.00	43.90		33.12	
Total Concentrates	109,754	57.73	54.68	57.68	.048	11.86	74.25
Stockpile Overrun-1955**	4,578	2.41	2.28				
Total Concts Produced & Shipped**	114,332	60.14	56.96	57.68	.048	11.86	77.35
-2" Wash Plant Rejects	3,505	1.84	1.75	29.51		53.13	
Total Fine Tailing (by difference)	72,271	38.02	36.00	25.39		62.30	

*Iron units calculated on plant crude basis.

**70 tons 1955 stockpile overrun on Hill wash ore included in these totals.

Retreat Plant Product	Tons	Per Cent Weight Plant	Per Cent Weight Pit	Per Cent Iron	Per Cent Phos	Per Cent Silica	Iron Units*
Crude to Plant	1,724,153	100.00	83.45	37.33		42.49	
Pit Rock	111,600		5.40	23.34		62.43	
Screen Plant Rock	230,250		11.15	24.05		61.44	
Pit Crude	2,066,003		100.00	35.09		45.68	
Total Concentrates	514,869	29.86	24.92	57.94	.046	10.80	46.34
Stockpile Overrun-1955	9,008	.52	.44				
Total Concts Produced & Shipped	523,877	30.38	25.36	57.94	.046	10.80	47.15
Heavy-Media Concentrates	400,366	23.22	19.38	58.14		10.30	
Heavy-Media Rejects	417,614	24.22	20.21	25.04		60.51	
Heavy-Media Feed	817,980	47.44	39.59	41.29		36.06	
-2" Wash Plant Rejects	160,034	9.28	7.75	24.10		62.52	
Total Fine Tailing (by difference)	622,628	36.12	30.13	31.64		51.91	

*Iron unit recovery calculated on plant basis.

c. Cyclone Plant

The cyclone plant followed almost the same operating schedule as the other two plants. Plant operations were considerably improved over previous seasons because of flowsheet changes effected during the winter, the principal change being the installation of new fluid coupling units on the two 8-inch cyclone feed pumps which permitted closer operator control over the performance of these pumps and resulted in improved concentrate grade.

On a calculated basis, 230,250 tons of cyclone feed sent to the plant produced 114,098 tons of concentrates at an average weight recovery of 50 per cent.

Separate shipment of coarse and fine concentrates could be made in cars simultaneously for the first time this season because of new fines loading facilities installed prior to the start of operations.

Out-of-ore and freezing weather constituted the largest delay items. Mechanical delays were minor. Following is a brief summary of delay time:

Source of Delay	Hours	Per Cent	Per Cent of 2066.41 Working Hours
Out of Ore	22.00	32.55	1.06
Cyclone Feed Pump	7.00	10.36	0.34
Conct Drain-Wash Screens	0.33	0.49	0.02
Reject Drain-Wash Screens	1.50	2.22	0.07
Reject Conveyor	3.00	4.44	0.15
Tram Screen Feed Pump	1.50	2.22	0.07
Media Return Pump	1.50	2.22	0.07
Adjust Gravity	2.00	2.96	0.10
Weekend Tieup	6.25	9.25	0.30
Electric Power	0.50	0.70	0.02
Freezing Weather	22.00	32.55	1.07
	67.58	100.00	3.27

Recapitulation

Ore to Head of Mill	22.00	32.55	1.06
Freezing Weather	22.00	32.56	1.07
Ore Processing Delays	23.58	34.89	1.14
	67.58	100.00	3.27

9. MAINTENANCE & REPAIRS

The winter repair program in progress at the start of the year was continued until ore season. After the ore season, repairs were made to dump cars and churn drills. Following completion of stripping, the 34-ton trucks were sent to the Hawkins and Canisteo mines; truck repairs will be done during March and April of 1957 for the next ore season. Normal repairs were conducted at the pit screen plant and conveyor system.

Following the close of the 1956 ore season, all plants were cleaned out and normal winter repairs were carried on until the end of the year.

10. COST of OPERATIONS

a. Comparative Mining Costs

Product	1956 Budget	1956 Year	1955 Year
Direct Shipping Ore			2,493
Washing Plant Concentrates	20,000	114,332	55,006
Retreat Plant Concentrates	524,929	523,877	590,611
Overrun	13,586		
	558,515	638,209	648,110
Per Cent Recovery			26.60
Average Daily Output			4,263
Tons Per Man Per Day			25.05
Days Operated			152
Costs			
Pit Operating	$0.258	$0.249	$0.222
Concentrating	0.281	0.282	0.262
Loading Stockpile Ore	0.015	0.007	0.024
General Mine Expense	0.199	0.183	0.186
Winter & Idle	0.549	0.527	0.474
Cost of Production	$2.863	$2.604	$2.512
Depreciation			
Plant & Equipment		0.069	0.059
Motorized Equipment		0.071	0.104
Movable Equipment		0.006	0.006
Amortization			
Defense Facilities		0.153	0.184
Stripping		0.000	0.000
Taxes			
Ad Valorem		0.095	0.188
Occupational		0.251	0.293
Royalty		0.213	0.224
Total Depreciation, Amortization, Taxes		$0.858	$1.058

Costs	1956	1955
Administrative Expense	$0.100	$0.100
Miscellaneous Expense & Income	0.014	-0.004
Royalty	1.627	1.493
Total Cost at Mine*	$5.203	$5.159

*1956 cost figures are taken from mine cost sheets as of December and do not include revisions by the Cleveland office.

b. Detailed Cost Comparison

Pit Operating: Cost was $0.009 below the budget and $0.027 over 1955 costs. Cost of blasting was $0.009 below the budget and $0.002 below 1955 costs due to increased use of ammonium nitrate fertilizer for blasting. Truck maintenance was $0.006 below the budget and $0.001 over 1955 costs. A more extensive truck repair program was carried on prior to the ore season than was anticipated at the time the budgets were prepared. Two additional rental trucks increased costs $0.007 over 1955 costs. A 10,000 gallon fuel tank and 841 feet of 36-inch conveyor belt costing $17,997.20 were included under pit operating. Considering the wage increase in August, the 1956 costs compare favorably with 1955 costs.

Beneficiation: Costs were $0.001 above the budget and $0.020 over 1955 costs. Transportation and concentrating-operating were slightly higher than the budget because of overtime hours necessitated late in the season to get out extra required tonnage.

Loading Stockpile: Cost was $0.008 lower than the budget and $0.017 lower than 1955 costs as less ore was loaded from stockpile than anticipated.

General Mine Expense: Cost was $0.016 lower than the budget and $0.003 below 1955 costs because of increased tonnage.

Winter & Idle: Cost was $0.022 below the budget and $0.053 above 1955 costs.

Cost of Production: Cost was $0.259 below the budget and $0.092 over 1955 costs. Wash ore was mined toward the end of the ore season to fulfill Mesaba-Cliffs requirements and this extra tonnage resulted in lowering the cost of production.

11. EXPLORATION & FUTURE EXPLORATION

A re-estimate of reserves for setting minimums in 1957 for the Hill-Walker lease initiated a limited drilling program. Eleven holes were layed out to total approximately 680 feet of drilling. The drilling program started by the Atkins-Walker Company on November 12 is expected to be completed by the end of January, 1957. With this program, the Hill-Walker drilling should be fairly well completed.

A few more holes are needed along the north bank of the Trumbull to determine actual mining limits.

Some additional holes will be needed to further prove or disprove ore beneath the present pit bottom in the Hill pit. Further exploration is required on the north bank of the Hill lease between the Hill pit and the Barbara. Most of this area has been drilled on 300-foot centers and does indicate some ore.

With only the eastern half of the Potter forty drilled to any extent, this lease will require more exploration.

The Gross-Marble lease will require more drilling on the south side.

12. TAXES

	1956		1955		Increase-Decrease	
Real Estate	Assessed Value	Taxes	Assessed Value	Taxes	Assessed Value	Taxes
Mineral	$244,574	$ 46,796.79	$211,261	$ 38,396.69	$33,313	$ 8,400.10
Land,Bldg,Machinery	144,723	35,020.89	141,989	32,291.37	2,734	2,729.52
Accounts Receivable	27,866	5,331.88			27,866	5,331.88
Personal Property						
Equipment	136,125	26,046.16	154,379	28,088.40	-18,254	-2,042.24
Stockpile	428	81.89	8,652	1,572.50	- 8,224	-1,490.61
	$553,716	$113,277.61	$516,281	$100,348.96	$37,435	$12,928.65
Average Mill Rate		204.58		194.35		10.23

Average mill rate increased by 5.27 per cent. Mineral value increased by addition of Gross-Marble mine. Land value increased by additional lands leased and purchased. Equipment values decreased by normal depreciation.

13. ACCIDENTS & PERSONAL INJURY

Name	Injury Date	Injury Nature	Cause	Time Lost Days	Time Lost Wks	Compensation Paid
Ernest G. Olson,Sr.	6-8-56	Strained metacarpal phalangeal joint, ligaments & extension, tendon of fourth finger right hand.	Steering wheel jackknifed while driving truck and spoke of wheel caught finger of right hand.		2	$80
Donald D. Hurlbut	10-16-56	Compound fracture distal phalanx third finger left hand. Sutured.	Dropped bolt in side plate, grabbed for it, caught third finger left hand in vibrating screen between screen cloth.	1	5	$206.66

14. PROPOSED NEW CONSTRUCTION

Extension of rock reject belt at the mill.
Raise and widen dike at tailings pond.
Relocate tailings discharge line.
Construct conveyor system to new rock reject area at the mill.

15. EQUIPMENT RECEIVED & PROPOSED NEW EQUIPMENT

a. New Equipment Received

#301 #299 & 302	1	D-8 Caterpillar Tractor
	3	3/4-ton Pickups
#284	1	300 hp Electric Motor
#290	1	10,000 gallon Fuel Tank
288	2	Fluid Couplings
#316	1	Hazelton 6" Pump
#297	1	Dings 36"x36" Magnetic Separator

#293	841'	36" Conveyor Belt
#303	946'	30" Conveyor Belt
	3200'	Bare Copper Trolley Wire
#312	432' 428'	24" Conveyor Belt
#317	1500'	#2 Power Shovel Cable
	1 Set	22" Track Group
	70'	13" Wide Elevator Belt
	1	Used 34-ton Truck Box - 311 cancelled
	1	Zip Lift Hoist
#305	1	4500 Gallon Water Tank
#296	2	125 hp Electric Motor
	1	Thor Rotary Air Grinder
#309	1	Joy Rotary Drill
	1200	8" Hardwood Ties

b. <u>Proposed New Equipment</u>

	3	Stainless Steel Sleeves for Jeffrey Separator
#338	1	36"x84" Derrick Screen
#324	1	1000 KVA Outdoor Transformer
#321	1	5'x14' Triple Deck Screen
	2	6'x20' Allis-Chalmers Low Head Screens
	1	40 hp TEFC Electric Motor
#330	1	3/4-ton Pickup
#331	1	2-ton Service Truck
#329	1	Primary Crockett
	1	Secondary Crockett
326	1	Rock Reject Stacker

HOLMAN-CLIFFS MINE

ANNUAL REPORT

YEAR 1956

1. GENERAL

The Holman-Cliffs mine operated in the usual cycle of operations except for a strike period from June 30 to August 7. Winter stripping was completed on January 28 and plant and shop crews engaged in repair work until April 17, at which time ore operations were started and continued until October 31. Construction of a cyclone plant and coarse-fines split facilities was underway from January 1 to completion during the last week in June. Concurrent stripping was carried forward during June and August. The winter stripping program started at the end of the ore season and was completed on December 29. Loading of concentrates from stockpile was started on April 10 and continued intermittently until November 27.

Except for a strike period, operating conditions were normal and no serious delays were experienced.

2. PRODUCTION-INVENTORIES-SHIPMENTS

a. Production by Grades

Crude	Wash	Retreat	Total
Holman		237,783	237,783
Brown		1,219,889	1,219,889
North Star	14,928	98,940	113,868
Holman Lake		179,670	179,670
Brown Lake		158,984	158,984
Bingham	612	297,148	297,760
North Star Lake		48,684	48,684
	15,540	2,241,098	2,256,638

Concentrates	Bessemer Wash	Bessemer Retreat	Non Bessemer Wash	Non Bessemer Retreat	Total
Holman	74	57,423		56,735	114,232
Brown	51	309,042		236,383	545,476
North Star	5,776	45,716	6,014	12,394	69,900
Holman Lake		17,481		46,490	63,971
Brown Lake		20,216		26,376	46,592
North Star Lake		4,164		23,600	27,764
Bingham		81,442	369	43,266	125,077
	5,901	535,484	6,383	445,244	993,012

b. Shipments

Holman	202	59,592		56,690	116,484
Brown	276	242,445	2,159	279,815	524,695
North Star	5,776	65,665	6,014	10,748	88,203
Holman Lake		17,481		46,490	63,971
Brown Lake		20,216		26,376	46,592
North Star Lake		4,164		23,600	27,764
Bingham		63,373	369	25,197	88,939
	6,254	472,936	8,542	468,916	956,648

c. Inventories

Holman Retreat	853
Brown Retreat	95,687
North Star Retreat	3,293
Bingham Retreat	36,138
	135,971