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THE CLEVELAND-CLIFFS IRON CO.
CLEVELAND, OHIO

CUSHING MINE
ANNUAL REPORT
YEAR 1955

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1. GENERAL

There was no activity at the Cushing mine proper, but the following forties were bought at an appraisal price of \$19,576 at a public tax forfeited sale conducted by Itasca County on October 26, 1955:

- NE-NE Section 27, 56-25
- SW-NW Section 27, 56-25
- NE-SW Section 27, 56-25
- SW-NE Section 28, 56-25
- N $\frac{1}{2}$ -NE Section 28, 56-25

The sale of the NW-SW and SW-SW of Section 26, 56-25 was withdrawn by the State of Minnesota at its auction on November 9, 1955. A lease will be negotiated for these forties.

Negotiations were started to purchase four forties in Sections 27 and 28, 56-25, from Messrs. Tanner and Johnson, and first refusal was granted The Cleveland-Cliffs Iron Company by Jones & Laughlin to purchase nine forties on Sections 26 and 27, 56-25, at a price of \$50 per acre.

Tax reserve estimates were made for the first time on May 1, 1954. An initial estimate of the tonnages and analyses of ore reserves as of May 1, 1954, is shown as follows:

<u>Concentrates</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Per Cent Recovery</u>
Non Bessemer Wash	1,094,446	58.28	.045*	8.69	60
Bessemer Retreat	601,506	56.50*	.031	11.00*	40
Non Bessemer Retreat	<u>1,080,501</u>	<u>57.00*</u>	<u>.047</u>	<u>10.00*</u>	<u>40</u>
	2,776,453	57.40	.043	9.70	48
<u>Total Concentrates</u>					
Bessemer	601,506	56.50*	.031	11.00*	
Non Bessemer	<u>2,174,947</u>	<u>57.75</u>	<u>.046</u>	<u>9.50</u>	
	2,776,453	57.40	.043	9.70	

* equals assumed analysis

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TAXES

	<u>1955</u>		<u>1954</u>		<u>Increase-Decrease</u>	
	<u>Assessed Value</u>	<u>Taxes</u>	<u>Assessed Value</u>	<u>Taxes</u>	<u>Assessed Value</u>	<u>Taxes</u>
Mineral	\$179,153	\$37,312.20	\$179,153	\$35,690.86	\$	\$1,621.34
Land	<u>1,068</u>	<u>222.43</u>	<u>1,068</u>	<u>212.77</u>		<u>9.66</u>
	\$180,221	\$37,534.63	\$180,221	\$35,903.63		\$1,631.00
Average Mill Rate		208.27		199.22	+	4.54%

Tax Commission Reserve

May 1, 1954	2,776,453
May 1, 1955	2,776,453

HAWKINS MINE

ANNUAL REPORT

YEAR 1955

1. GENERAL

In 1955, operations at the Hawkins mine were opened up with the start of washing plant repairs on February 21 and shovel and truck repairs on April 4. Ore operations began April 25 on a 2-shift, 5-day schedule at the Hawkins mine and a 3-shift, 5-day schedule at the International Harvester fines plant.

Stockpile loading began April 18 and taxable ore shipments were completed April 27; remaining stockpile shipments were completed in May.

Starting in May, a total of 1692 tons of obsolete scrap and equipment was loaded intermittently throughout the operating season.

Because of a greater demand for ore, a 3-shift, 6-day schedule was put into effect on June 13 and continued until the close of the ore season. The International Harvester fines plant schedule was reduced to 2-shifts, 6-days-per-week on June 27 and completed on September 16.

Ore production from the Hawkins and MacKillican mines was completed October 27, at which time stripping was started on a 3-shift, 5-day schedule until the close of the year.

2. PRODUCTION-SHIPMENTS-INVENTORIES

a. Production by Grades

<u>Crude</u>	<u>Wash</u>	<u>Retreat</u>	<u>Total</u>
Hawkins	89,537	1,932,594	2,022,131
MacKillican		<u>259,769</u>	<u>259,769</u>
	<u>89,537</u>	<u>2,192,363</u>	<u>2,281,900</u>
IHC Fines			176,277
<u>Concentrates</u>			
Hawkins	53,753	769,071	822,824
MacKillican		<u>92,065</u>	<u>92,065</u>
	<u>53,753</u>	<u>861,136</u>	<u>914,889</u>
IHC Fines			56,954

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b. Shipment by Grades

<u>Bessemer</u>		<u>Non Bessemer</u>		<u>Total</u>	<u>IHC Fines</u>
<u>Wash</u>	<u>Retreat</u>	<u>Wash</u>	<u>Retreat</u>		
248	74,520	62,344	710,167	847,279	56,594

MacKillican shipment same as MacKillican production.

c. Stockpile Inventories

Hawkins Retreat 15,440

d. Production by Months—Crude

<u>Month</u>	<u>Hawkins</u>		<u>MacKillican Retreat</u>	<u>Total</u>	<u>IHC Fines</u>
	<u>Wash</u>	<u>Retreat</u>			
April	4,269	47,562		51,831	8,454
May	41,674	213,336		255,010	42,738
June	3,031	72,809	184,772	260,612	44,343
July	12,569	359,101		371,670	28,140
August		495,681		495,681	36,663
September	25,364	438,826		464,190	15,939
October	<u>2,630</u>	<u>305,279</u>	<u>74,997</u>	<u>382,906</u>	
	89,537	1,932,594	259,769	2,281,900	176,277

Production by Months—Concentrates

April	2,212	20,842		23,054	3,196
May	27,382	61,527		88,909	12,924
June	1,625	29,079	74,584	105,288	11,401
July	6,864	142,972		149,836	8,175
August		208,203	53	208,256	12,319
September	12,969	187,618		200,587	8,939
October	<u>2,701</u>	<u>118,830</u>	<u>17,428</u>	<u>138,959</u>	
	53,753	769,071	92,065	914,889	56,954

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3. ANALYSIS

a. Tonnage & Analysis of Crude Ore Produced

<u>Material</u>	<u>Tons</u>	<u>Iron</u>	<u>Silica</u>
Hawkins Wash	89,537	39.94	37.60
Hawkins Retreat	1,932,594	39.57	38.22
MacKillican Retreat	259,769	37.01	42.95
	2,281,900	39.29	38.73
IHC Fines	176,277	42.54	35.03

b. Tonnage & Analysis of Concentrates Produced

<u>Hawkins</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>	<u>Moisture</u>
Bessemer Wash	248	56.62	.065	11.34	.43	.80	9.15
Non Bessemer Wash	53,505	56.34	.045	11.83	.38	.53	7.13
Bessemer Retreat	74,520	57.48	.036	11.63	.48	.41	6.29
Non Bessemer Retreat	694,551	57.03	.041	11.49	.73	.44	6.66
	822,824	57.02	.041	11.53	.69	.45	6.66
IHC Fines	56,954	58.01	.034	12.49	.28	.50	8.55
MacKillican Retreat	92,065	56.67	.060	13.11	.29	.60	7.28

c. Tonnage & Complete Analysis of Concentrates Shipped

<u>Hawkins</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>	<u>Lime</u>	<u>Mag</u>	<u>Sulfur</u>	<u>Ign Loss</u>	<u>Moist</u>
Bessemer Wash	248	56.62	.065	11.34	.43	.80	.10	.10	.009	6.49	9.15
Non Bessemer Wash	62,344	58.38	.050	11.73	.49	.60	.10	.10	.009	3.80	7.15
Bessemer Retreat	74,520	57.48	.036	11.63	.48	.41	.10	.10	.009	4.79	6.29
Non Bessemer Retreat	710,167	57.08	.042	11.49	.71	.46	.10	.10	.009	6.03	6.70
	847,279	57.21	.042	11.52	.67	.46	.10	.10	.009	4.95	6.70
MacKillican Retreat	92,065	56.67	.060	13.11	.29	.60					7.28

d. Tonnage & Analysis of Ore in Inventory

<u>Hawkins</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>	<u>Moisture</u>
Retreat	15,440	56.94	.042	11.68	.74	.43	6.79

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4. ESTIMATE of ORE RESERVES

a. Developed Ore - Factors Used

	<u>Concentrates</u>	<u>Cubic Feet Per Ton</u>	<u>Rock Deduction</u>	<u>Per Cent Recovery</u>
Wash		14	0	50
Retreat		14	0	35

b. Estimated Reserves

<u>Hawkins Concentrates</u>	<u>Reserve 12-31-54</u>	<u>Mined 1955</u>	<u>Balance After Mining</u>	<u>Changed by Re-estimate</u>	<u>Reserve 12-31-55</u>
<u>SE-NE 31, 57-22</u>					
Open Pit Wash	531,132		531,132	-285,980	245,152
Open Pit Retreat	623,967	224,066	399,901	44,753	444,654
Underground Wash					
Underground Retreat					
	<u>1,155,099</u>	<u>224,066</u>	<u>931,033</u>	<u>-241,227</u>	<u>689,806</u>
<u>NE-SE 31, 57-22</u>					
Open Pit Wash	859,712	35,048	824,664	-302,394	522,270
Open Pit Retreat	791,319	225,725	565,594	140,185	705,779
Underground Wash	81,074		81,074	- 59,702	21,372
Underground Retreat	364,806		364,806	364,806	
	<u>2,096,911</u>	<u>260,773</u>	<u>1,836,138</u>	<u>7586,717</u>	<u>1,249,421</u>
<u>SW-NW 32, 57-22</u>					
Open Pit Wash	203,988		203,988	-102,041	101,947
Open Pit Retreat	905,624	294,706	610,918	71,816	682,734
Underground Wash	150,819		150,819	-128,647	22,172
Underground Retreat	265,513		265,513	265,513	
	<u>1,525,944</u>	<u>294,706</u>	<u>1,231,238</u>	<u>-424,385</u>	<u>806,853</u>
<u>NW-SW 32, 57-22</u>					
Open Pit Wash	62,448	18,705	43,743	136,188	179,931
Open Pit Retreat	640	24,574	-23,934	40,160	16,226
Underground Wash	687,053		687,053	-318,239	368,814
Underground Retreat	56,138		56,138	- 56,138	
	<u>806,279</u>	<u>43,279</u>	<u>763,000</u>	<u>-198,029</u>	<u>564,971</u>

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c. Estimated Analysis of Ore Reserves

<u>Hawkins Concentrates</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>
<u>SE-NE 31, 57-22</u>				
Bessemer Wash Open Pit	105,604	61.18	.027	9.49
Non Bessemer Wash Open Pit	139,548	57.35	.062	9.54
Bessemer Retreat Open Pit	334,574	59.31	.030	10.26
Non Bessemer Retreat Open Pit	<u>110,080</u>	<u>59.31</u>	<u>.052</u>	<u>10.26</u>
	689,806	59.20	.040	10.00
<u>NE-SE 31, 57-22</u>				
Bessemer Wash Open Pit	407,672	58.69	.028	10.25
Non Bessemer Wash Open Pit	114,598	60.08	.060	9.97
Bessemer Retreat Open Pit	642,702	58.10	.031	10.76
Non Bessemer Retreat Open Pit	63,077	58.10	.052	10.76
Bessemer Wash Underground	<u>21,372</u>	<u>57.19</u>	<u>.024</u>	<u>9.43</u>
	1,249,421	58.47	.034	10.50
<u>SW-NW 32, 57-22</u>				
Bessemer Wash Open Pit	47,888	58.66	.030	10.27
Non Bessemer Wash Open Pit	54,059	57.87	.054	9.61
Bessemer Retreat Open Pit	555,724	57.64	.029	10.39
Non Bessemer Retreat Open Pit	127,010	57.64	.056	10.39
Bessemer Wash Underground	15,315	56.41	.020	11.18
Non Bessemer Wash Underground	<u>6,857</u>	<u>56.37</u>	<u>.069</u>	<u>11.76</u>
	806,853	57.68	.035	10.36
<u>NW-SW 32, 57-22</u>				
Bessemer Wash Open Pit	16,553	59.45	.035	9.36
Non Bessemer Wash Open Pit	163,378	57.26	.062	10.18
Bessemer Retreat Open Pit	9,920	57.64	.029	10.39
Non Bessemer Retreat Open Pit	6,306	57.64	.056	10.39
Bessemer Wash Underground	239,323	58.32	.031	9.59
Non Bessemer Wash Underground	<u>129,491</u>	<u>56.99</u>	<u>.060</u>	<u>10.04</u>
	564,971	57.72	.047	9.88
Total Bessemer Wash Open Pit	577,717	59.16	.028	10.09
Total Non Bess Wash Open Pit	<u>471,583</u>	<u>58.18</u>	<u>.061</u>	<u>9.87</u>
	1,049,300	58.72	.043	9.99
Total Bessemer Retreat Open Pit	1,542,920	58.19	.030	10.52
Total Non Bess Retreat Open Pit	<u>306,473</u>	<u>58.33</u>	<u>.054</u>	<u>10.42</u>
	1,849,393	58.21	.034	10.50

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<u>Hawkins Concentrates</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>
Total Bessemer Wash Underground	276,010	58.13	.030	9.67
Total Non Bess Wash Underground	<u>136,348</u>	<u>56.96</u>	<u>.060</u>	<u>10.13</u>
	412,358	57.74	.040	9.82
<u>Total Hawkins Concentrates</u>	3,311,051	58.32	.038	10.26

5. LABOR & WAGES

a. Comments

An ample labor supply existed during the year and very little turnover was experienced.

A 1-day strike was in effect on July 1. A raise of \$0.115 was effective July 1 plus a one-half cent increment increase between job classes.

b. Comparative Statement of Production

<u>Product</u>	<u>914,889 Tons Concentrates</u>
Number of Shifts & Hours	2 & 3 Shifts, 8 Hours
Average Number of Men Working	132.0
Average Wages Per Hour	\$2.540
Product Per Man Per Day	36.22
Labor Cost Per Man Per Ton	\$0.5648
Total Number of Days	153.0
Amount Paid for Labor	\$516,732.85

6. GENERAL SURFACE

a. Building & Repair

A concrete floor was completed in the machine shop, and only necessary repairs were made to mine buildings.

b. Roads

No Changes

c. Power Lines

A new power line was constructed from surface to pit bottom to service the pit.

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7. OPEN PIT

a. Stripping

No stripping was scheduled during the first half of the year. Immediately after the close of ore season on October 27, taconite and paint rock stripping operations were begun on the north and southeast sides of the pit on a 3-shift, 5-day schedule which continued on into 1956.

Following is a tabulation showing stripping removed, man hours, and cost per yard for Hawkins stripping. Only a small amount of MacKillican stripping was removed in 1955:

<u>Stripping</u>	<u>Cubic Yards</u>	<u>Yards Per Shift</u>	<u>Man Hours</u>	<u>Cost Per Yard</u>
Hawkins E&A-677	316,885	2,401	32,108	\$0.663
MacKillican	<u>4,689</u>	<u>1,563</u>	<u>205</u>	<u>\$0.366</u>
Total	321,574	2,382	32,313	\$0.658

b. Open Pit Mining

The 1955 ore season began on April 25, working alternately between the Hawkins and MacKillican mines. Due to low recovery ore, production from the MacKillican was cut to a minimum in order to meet the required production from the Hawkins mine. The major Hawkins production came from the north side of the pit where, despite a heavy rock extraction, a good grade of ore was produced and a good recovery was maintained.

The amount of rock encountered plus a 4-mile-round-trip haul on rock necessitated weekend work on rock cleanup. Two additional trucks have been ordered for 1956 to eliminate over-time work.

A low recovery ore was produced from the west pit in the MacKillican mine. Drilling in this area by the M. A. Hanna Company showed an estimated 38 per cent recovery as compared to an actual plant recovery of 17 per cent.

A study of the remaining reserve in the MacKillican is under way to determine future mining plans.

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Production from the pit was as follows:

	Crude						Pit				
	Shifts	Wash Plant			Pit			Shifts	Crude	Tons Per Shift	Cost Per Ton
Plant Crude		Tons Per Shift	2" Rejects	Pit Rock	Tons Screen Rejects						
<u>Hawkins</u>											
Wash	18	89,537	4,974		330	5,836	18	95,703	5,317	\$0.256	
Retreat	323	1,945,113	6,022	12,519	158,714	297,762	335	2,401,589	7,169	0.256	
	341	2,034,650	5,967	12,519	159,044	303,598	353	2,497,292	7,074	\$0.256	
<u>MacKillican</u>											
Wash										\$0.281	
Retreat	52	259,769	4,996			85,790	52	345,559	6,645	0.281	
	52	259,769	4,996			85,790	52	345,559	6,645	\$0.281	
<u>Totals</u>											
Wash	18	89,537	4,974		330	5,836	18	95,703	5,317	\$0.259	
Retreat	375	2,204,882	5,880	12,519	158,714	383,552	387	2,747,148	7,099	\$0.259	
	393	2,294,419	5,838	12,519	159,044	389,388	405	2,842,851	7,019	\$0.259	

c. Pumping & Drainage

Approximately 1500 gallons per minute were pumped from the Hawkins mine.

d. General Pit Activities

Pit activities in the Hawkins were confined to the 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

Plant operations for the season were satisfactory. In spite of a 3-shift, 6-day-per-week schedule, downtime in the plant was relatively minor.

In the cyclone plant, a recirculating pump which pumped water to the washing plant primary screens effected a saving of approximately 1000 gallons per minute of clear water.

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The secondary plant screens which gave us considerable trouble during the season are being replaced with re-designed screens on an adjustment basis by the Simplicity Screen Company.

The operating season extended from April 25 to October 27 with the same shift schedule as the pit.

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

<u>Source of Delay</u>	<u>Hours</u>	<u>Per Cent</u>	<u>Per Cent of 3168.00 Working Hours</u>
Out of Ore	113.41	46.87	3.58
Pit Screening Plant	10.54	4.36	0.33
Crude Ore Conveyor	45.25	18.70	1.43
Primary Screens	14.74	6.09	0.47
Scalping Gate	0.50	0.21	0.02
Rock Pocket	1.78	0.74	0.06
Crusher Feed Conveyor	2.37	0.98	0.08
Crushers	0.92	0.38	0.03
Crusher Product Conveyor	7.66	3.17	0.24
Crusher Screen Undersize Pump	3.08	1.27	0.10
Secondary Screens	4.25	1.76	0.13
Conveyor to Surge Pile	17.91	7.40	0.56
Classifiers	0.75	0.30	0.02
Coarse Concentrate Conveyor	1.17	0.48	0.04
Fine Concentrate Conveyor	0.83	0.34	0.03
Concentrate Stockpile Conveyor	2.51	1.04	0.08
Concentrate Stacker	0.17	0.07	0.01
Miscellaneous Chutes & Launderers	7.29	3.01	0.22
Electric Power	6.50	2.69	0.20
Air Compressor	0.33	0.14	0.01
	<u>241.96</u>	<u>100.00</u>	<u>7.64</u>

Recapitulation

Crude Ore Delays			
Ore to Head of Mill	169.20	69.93	5.34
Ore Processing Delays	<u>72.76</u>	<u>30.07</u>	<u>2.30</u>
	<u>241.96</u>	<u>100.00</u>	<u>7.64</u>

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b. Retreat Plant

The Heavy-Media plant operated satisfactorily during the season. An additional magnetic separator is being installed on the coarse side to further reduce media losses.

Heavy-Media plant delays were as follows:

<u>Source of Delay</u>	<u>Hours</u>	<u>Per Cent</u>	<u>Per Cent of 3295.84 Working Hours</u>
Out of Ore	58.91	36.59	1.79
Surge Pile Feeder	8.00	4.97	0.24
Heavy-Media Feed Conveyor	4.08	2.53	0.12
Feed Preparation Screen	6.88	4.27	0.21
Circulating Media Pumps	3.50	2.17	0.11
Coarse Heavy-Media Feed Conveyor	0.37	0.23	0.01
Fine Heavy-Media Feed Conveyor	3.75	2.33	0.11
Akins Separator	0.50	0.31	0.02
Hardinge Separator	1.50	0.93	0.05
Coarse Concentrating Screen	10.25	6.37	0.31
Coarse Reject Screen	6.00	3.73	0.18
Fine Reject Screen	7.38	4.59	0.22
Dirty Media Pumps	4.00	2.48	0.12
Magnetic Separators	4.00	2.48	0.12
Crockett Sands Pump	9.00	5.59	0.27
Coarse Concentrate Conveyor	2.17	1.35	0.07
Concentrate Stockpile Conveyor	1.17	0.73	0.04
Miscellaneous Chutes & Launderers	4.80	2.98	0.15
Rock Truck	5.34	3.32	0.16
Plant Charge-up & Tie-up	4.00	2.48	0.12
Adjust Gravity	1.50	0.93	0.05
Electric Power	13.33	8.28	0.40
Air Compressor	0.58	0.36	0.02
	<u>161.01</u>	<u>100.00</u>	<u>4.89</u>

Recapitulation

<u>Crude Ore Delays</u>			
Ore to Head of Mill	70.99	44.09	2.15
Ore Processing Delays	<u>90.02</u>	<u>55.91</u>	<u>2.74</u>
	<u>161.01</u>	<u>100.00</u>	<u>4.89</u>

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c. Cyclone Plant

Although greatly improved by the installation of additional magnetic separators which lowered media loss considerably, plant operation was still below that of the Heavy-Media and washing plants. This was primarily due to the lack of screening area on the wash and drain screen. Larger screens are being installed to improve production and concentrate grade.

Cyclone delays are listed below:

<u>Source of Delay</u>	<u>Hours</u>	<u>Per Cent</u>	<u>Per Cent of 2951.42 Working Hours</u>
Magnetic Cobbers	63.92	10.35	2.17
Out of Ore	43.00	6.96	1.46
Out of Ore-Processing Wash Ore	5.00	0.81	0.17
Bucket Elevator	141.00	22.83	4.77
Dewatering Screens	9.75	1.58	0.33
Roll Feeders	3.50	0.57	0.12
Cyclone Feed Sumps & Pumps	54.52	8.83	1.85
Circulating Media Pipeline	1.00	0.16	0.04
Cyclones	2.00	0.32	0.07
Change Cyclone Apexes	1.25	0.20	0.04
Sink Drain & Wash Screens	57.80	9.36	1.96
Float Drain & Wash Screens	45.12	7.31	1.53
Float Primary Magnetic Separators	20.01	3.24	0.68
Sink Secondary Magnetic Separators	3.25	0.53	0.10
Float Tramp Screen Feed Pump	0.75	0.12	0.03
Float Tramp Screen	7.50	1.21	0.25
Sink Tramp Screen Feed Pump	5.25	0.85	0.18
Sink Tramp Screen	7.50	1.21	0.25
Media Return Pump	2.50	0.40	0.08
Concentrate Pump	10.58	1.72	0.36
Concentrate Pipeline	1.25	0.20	0.04
Concentrate Dewatering Classifier	9.75	1.58	0.33
Tailings Pump	0.75	0.12	0.03
Fine Concentrate Conveyor	1.50	0.24	0.05
Thickener Underflow Pumps	15.50	2.51	0.53
Thickener Overflow Pumps	0.25	0.04	0.01
Miscellaneous Chutes & Launderers	1.58	0.26	0.05
Plant Charge-up and Tie-up	92.50	14.98	3.13
Clear Water Pump	3.50	0.57	0.12

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<u>Source of Delay</u>	<u>Hours</u>	<u>Per Cent</u>	<u>Per Cent of 2951.42 Working Hours</u>
Low Water in Reservoir	1.50	0.24	0.050
Electric Power	<u>4.25</u>	<u>0.70</u>	<u>0.140</u>
	617.53	100.00	20.92

Recapitulation

Crude Ore Delays			
Ore to Head of Mill	249.17	40.35	8.44
Ore Processing Delays	<u>368.36</u>	<u>59.65</u>	<u>12.48</u>
	617.53	100.00	20.92

d. International Harvester Tailings Basin Plant

The International Harvester tailings plant started operations on April 27 on a 3-shift, 5-day schedule and cut back to a 2-shift, 6-day schedule on June 27 to maintain the same schedule as the Hawkins plant.

Operations were conducted in the lower or lean end of the mining area in order to balance mining over the next two years. The required grade was produced in spite of the fact that the lower end of the pond was mined.

Production halted on September 16, 1955. A total of 176,277 tons of crude processed produced 56,954 tons of concentrates at an average recovery of 32.30 per cent.

A summary of delays follows:

<u>Source of Delay</u>	<u>Hours</u>	<u>Per Cent</u>	<u>Per Cent of 2192.00 Working Hours</u>
Dragline	20.58	8.07	0.94
Move Screening Plant	32.16	12.60	1.46
Screening Plant Feeder	16.59	6.50	0.76
Screening Plant Trash Screen	14.84	5.82	0.68
Screening Plant Trash Conveyor	25.54	10.01	1.16
Screening Plant Miscellaneous	9.00	3.53	0.41
Plant Feed Pump	16.15	6.33	0.74

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<u>Source of Delay</u>	<u>Hours</u>	<u>Per Cent</u>	<u>Per Cent of 2192.00 Working Hours</u>
Plant Feed Pipeline	24.45	9.58	1.12
Hydroseparator	5.25	2.06	0.24
Hydroseparator Underflow Pump	0.17	0.07	0.01
Sizer Feed Lines	0.50	0.20	0.02
Spiral Feed Pump	1.00	0.39	0.05
Concentrate Pump	4.42	1.74	0.20
Concentrate Pipeline	0.67	0.26	0.03
Dewatering Classifier	0.75	0.29	0.03
Railroad Cars & Tracks	22.67	8.89	1.03
Clear Water Pump	1.95	0.76	0.09
Clear Water Pipeline	7.92	3.10	0.36
Plant Start-up & Tie-up	40.45	15.85	1.85
Electric Power	10.08	3.95	0.46
	<u>255.14</u>	<u>100.00</u>	<u>11.64</u>

Recapitulation

Crude Ore Delays			
Ore to Head of Mill	159.31	62.44	7.27
Ore Processing Delays	<u>95.83</u>	<u>37.56</u>	<u>4.37</u>
	<u>255.14</u>	<u>100.00</u>	<u>11.64</u>

e. Complete Concentration Data for 1955

<u>Hawkins Washing Plant Product</u>	<u>Tonnage</u>	<u>Per Cent of Total Mined</u>	<u>Per Cent Iron Dried</u>	<u>Recovery</u>	
				<u>Tonnage</u>	<u>Iron Unit</u>
Crude Ore & Rock Mined	95,703	100.00	39.03		
Less Rock Removed in Mining	330	.35	28.00		
Crude Ore Transfer to Screening Plant	95,373	99.65	39.07		
Less Rock Rejects in Screening Plant	5,836	6.10	25.71		
Crude Ore Entering Mill	89,537	93.55	39.94		
Concentrates Produced	53,753	56.28	56.20	60.03	84.48
Tailings (by deduction)	35,784	37.27	15.39		

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Hawkins Retreat Plant Product	Tonnage	Per Cent of Total Mined	Per Cent Iron Dried	Recovery	
				Tonnage	Iron Unit
Crude Ore & Rock Mined	2,401,589	100.00	36.57		
Less Rock Removed in Mining	158,714	6.61	23.84		
Crude Ore Transfer to Screening Plant	2,242,875	93.39	37.47		
Less Rock Rejects in Screening Plant	297,762	12.40	23.80		
Crude Ore Entering Mill	1,945,113	80.99	39.57		
Concentrates Produced	769,071	32.02	57.01	39.54	56.97
Heavy-Media Rejects	259,892	10.82	40.45		
Plus 2" Wash Plant Rejects	12,519	.52	20.86		
Tailings (by deduction)	903,631	37.63	24.73		
<u>MacKillican Mine Retreat Plant</u>					
Crude Ore & Rock Mined	352,816	100.00	33.81		
Less Rock Removed in Mining	7,257	2.06	25.87		
Crude Ore Transfer to Screening Plant	345,559	97.94	33.98		
Less Rock Rejects in Screening Plant	85,790	24.31	24.80		
Crude Ore Entering Mill	259,769	73.63	37.01		
Concentrates Produced	92,065	26.09	56.65	35.44	52.03
Heavy-Media Rejects	45,078	12.78	40.29		
Tailings (by deduction)	122,626	34.76	21.05		

9. MAINTENANCE & REPAIR

In an effort to reduce Winter & Idle expense, repairs to pit equipment were done as much as possible during the operating season.

The concentrating plant did not have the advantage of a third shift for repairs, and considerable repair work was done during the fall and winter season.

10. COST of OPERATIONS

a. Comparative Mining Costs

Hawkins & MacKillican Combined

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<u>Product</u>	<u>1955 Estimate</u>	<u>1955 Production</u>	<u>1954 Production</u>
Wash Concentrates	75,000	53,753	64,681
Per Cent Recovery	50.68	55.17	51.99
Retreat Concentrates	822,251	861,136	381,590
Per Cent Recovery	33.33	33.07	39.35
Total Production	897,251	914,889	446,271
Stockpile Overrun			<u>11,593</u>
Grand Total Production	<u>897,251</u>	<u>914,889</u>	<u>457,864</u>
Average Daily Output		6,137	5,516
Tons Per Man Per Day		36.22	39.61
Days Operated		153	83

Fine Ore Plant

Concentrates	80,000	56,954	100,996
Per Cent Recovery	38.09	32.31	44.41
Average Daily Output		500	918
Tons Per Man Per Day		20.62	29.38
Days Operated		114	110

Costs

Total Pit Operating	\$0.275	\$0.259	\$0.266
Total Concentrating	0.220	0.196	0.165
Loading Stockpile Ore	0.012	0.009	0.012
Miscellaneous Pit & Beneficiation	0.085	0.092	0.136
Total General Mine Expense	0.119	0.139	0.158
Winter & Idle Expense	<u>0.344</u>	<u>0.306</u>	<u>1.017</u>
Cost of Production	<u>\$1.923</u>	<u>\$1.843</u>	<u>\$2.348</u>

Depreciation

Plant & Equipment	\$0.227	\$0.208
Motorized & Other Equipment	0.055	0.043
Movable Equipment	0.004	0.008

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	<u>1955</u> <u>Production</u>	<u>1954</u> <u>Production</u>
<u>Amortization</u>		
Stripping	-\$0.001	-\$0.192
<u>Taxes</u>		
Ad Valorem	\$0.249	\$0.518
Occupational	0.163	0.165
Royalty	0.135	0.167
Total Depreciation, Amortization, Taxes	\$0.832	\$0.917
Administrative Expense	\$0.045	\$0.032
Miscellaneous Expense & Income	- 0.004	0.015
Royalty	<u>1.105</u>	<u> </u>
Grand Total Cost at Mine	<u>\$3.821</u>	<u>\$3.312</u>

Note: 1955 Production Figures Not Final Year-end Cleveland Figures.

b. Detailed Cost Comparison

Pit costs were improved over last year in spite of the greater amount of rock encountered in the pit which raised truck and shovel operating costs. Truck and shovel maintenance was higher as a concurrent repair program was carried on during the operating season in order to reduce Winter & Idle costs.

Screening and conveying maintenance increased from \$0.001 to \$0.013 because of replaced pit belt #2 originally requested under an E&A but later expensed. Other charges were slightly lower than in 1954.

c. Beneficiation Costs

Concentration costs, although slightly higher than in 1954 due to treating more low recovery ore through the cyclone plant, were normal and compared favorably with the budget. Recovery had a decided effect on cost comparisons as recovery dropped from 40 per cent in 1954 to 33 per cent in 1955.

d. Winter & Idle Expense

Lower production in 1954 resulting in less plant and equipment repair reduced Winter & Idle costs from \$1.017 to \$0.256 per ton

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and money from \$468,256.17 to \$236,168.16. Further Winter & Idle cost reduction was accomplished by a continuous program of truck and shovel repair during the operating season.

11. EXPLORATION & FUTURE EXPLORATION

None

12. TAXES

Hawkins	1955		1954		Increase-Decrease	
	Assessed Value	Taxes	Assessed Value	Taxes	Assessed Value	Taxes
Mineral	\$463,015	\$152,827.36	\$562,623	\$168,066.74	-\$99,608	-\$15,239.38
Land, Bldg, Mach.	110,275	35,589.02	110,274	32,129.25	1	3,459.77
<u>Personal Property</u>						
Equipment	113,297	37,296.04	115,146	34,229.41	- 1,849	3,066.63
Stockpile	5,207	1,718.67	8,778	2,622.16	- 3,571	- 903.49
IHC Basin Land, Plant	11,197	2,763.63	11,197	2,409.81		353.82
	<u>\$702,991</u>	<u>\$230,194.72</u>	<u>\$808,018</u>	<u>\$239,457.37</u>	<u>-\$105,027</u>	<u>-\$9,262.65</u>
Average Mill Rate		327.45		296.35	+	10.50

IHC Tailings Basin*

<u>Personal Property</u>						
Tailings Basin-Mineral	27,641	6,822.35	54,314	11,689.46	- 26,673	- 4,867.11
Mill Rate		246.82		215.22	+	14.68

Note: Revised estimate on mineral reserve and smaller stockpile on hand reduced mineral value. Personal Property: 5 trucks at Sargent, 5 sold, and 3 leased trucks plus depreciation reduced personal property value which was offset by increased mill rate to increase total personal property tax. No change in land and building values.

* Paid direct by IHC; not included in CCI taxes.
Mineral basin valuation reduced by 1954 production.

Tax Commission Reserve

May 1	Tons		Increase Decrease
	1955	1954	
Hawkins	4,113,519	5,879,394	-1,765,875
IHC Tailings Basin	107,972	212,164	- 104,192

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Note: Re-estimate on Hawkins mineral reserve, 1955, eliminated some low valued ore:

Underground concentrate: from 918,946 tons to 412,358 tons
Tax value: .01 per ton

Underground retreat: from 686,457 at .005

- | | |
|---|------|
| 13. <u>ACCIDENTS & PERSONAL INJURY</u> | None |
| 14. <u>PROPOSED NEW CONSTRUCTION</u> | None |
| 15. <u>EQUIPMENT & PROPOSED NEW EQUIPMENT</u> | |
| a. <u>Equipment Received</u> | |
| 1 End Loader | |
| 2 Pickup Trucks | |
| b. <u>Proposed New Equipment</u> | |
| 1 Pickup Truck | |
| 2 34-Ton Euclids on a Rental Basis | |
| 1 Grader to Replace Present Adams Grader | |
| 2 6x20 Screens-Washing Plant | |
| 2 6x16 Screens-Cyclone Plant | |
| 2 50T Drills to Replace Present Drills | |

HILL-TRUMBULL MINEANNUAL REPORTYEAR 19551. GENERAL

Complete shutdown of the mine at the beginning of the year was a continuation of an economy drive started after the slow ore season of 1954. All foremen were used on a watching program.

A limited repair and remodelling program was started on March 1: In the washing plant, crushers were dismantled for general repair and replacement of mantles and liners; in the Heavy-Media plant, necessary pipe and screen changes were made; in the cyclone plant, some remodelling was started and four additional magnetic separators were installed.

A limited repair and maintenance program was started in the shops on April 4: Minor repairs were made to pit conveyors and screening plant; mine shops repaired shovels, drills, haulage cars, and miscellaneous equipment; and the truck shop repaired trucks, tractors, and graders.

Although there was ore in stockpile, no loading was necessary in the spring of 1955 until after the plants had started to operate.

Pit cleanup started during the week of April 18 with one shovel and four trucks working on a single-shift schedule. 7,488 cubic yards of cleanup were moved along the Trumbull road leading to the Hill-Walker pit and along the Hill road leading to the rock dump.

Ore production started on April 25 on a 2-shift, 5-day-week schedule which continued until July 5 when all operations were placed on a 2-shift, 6-day-week schedule and remained so until the end of ore operations on October 26.

Two to three shovels in ore, serviced by eight to ten trucks, produced 2,394,638 tons of crude wash and retreat ore which yielded 645,617 tons of concentrates. Shift production of crude ore averaged 7,460 tons at a recovery of 26.96 per cent, 1.75 per cent below the 1954 recovery of 28.71 per cent.

Wash ore was mined mainly along the south property line of the Trumbull lease with a very minor amount from the Hill lease. From 101,419 tons of crude, 55,006 tons of concentrates were produced. Shift production of washed concentrates averaged 4,584 tons at a recovery of 54.24 per cent, 2.39 per cent below the 1954 recovery of 56.63 per cent.

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A total of 2,292,859 tons of retreat crude was mined from the following areas:

1. West, north, east, and a minor amount from the south side of the Hill-Walker.
2. Southeast corner of the Potter.
3. North side of the Hill and scam area.
4. North side and center of the Gross-Marble.
5. West Trumbull: Area leading to the Gross-Marble; slough area on the south side; and the southeast corner.

A breakdown of the tonnages produced and concentrates yielded is shown as follows:

<u>Property</u>	<u>Material</u>	<u>Tons Produced</u>	<u>Concentrates Yielded</u>
Hill-Walker	Retreat Crude	502,751	127,163
Hill	Retreat & Scram	767,814	186,286
Trumbull	Retreat Crude	576,974	146,385
Potter	Retreat Crude	68,687	12,164
Gross-Marble	Retreat Crude	<u>376,633</u>	<u>118,613</u>
		2,292,859	590,611

Shift production of retreat concentrates averaged 2,037 tons at an average recovery of 25.76 per cent.

2,493 tons of direct ore were mined from a cretaceous layer along the north side of the Hill-Walker.

A railroad car shortage necessitated the stockpiling of 121,856 tons of concentrates during the season.

Following the close of mining operations, plant and conveyor systems were cleaned out and crews shifted to stripping, bridge construction, equipment and plant repairs, and dyke power line installation.

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

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1. North and west side of Hill-Walker.
2. Northwest corner of Gross-Marble.
3. Southeast corner of Potter.
4. Transfer Hill-Trumbull pit rock dump to dump north of pit.

Stockpile loading was resumed after shutdown of mining operations and continued intermittently as cars were available until November 11 with 5,565 tons of stockpile overrun being loaded. Stockpile balances of all leases were down to zero at the end of the season.

2. PRODUCTION-SHIPMENTS-INVENTORIES

a. Production by Grades

	<u>Crude</u>	<u>Wash</u>	<u>Retreat</u>	<u>Total</u>
Hill		8,273	650,304	658,577
Hill-Walker			411,911	411,911
Trumbull		92,336	496,544	588,880
Potter			45,407	45,407
Gross-Marble			<u>344,263</u>	<u>344,263</u>
		<u>100,609</u>	<u>1,948,429</u>	<u>2,049,038</u>

	<u>Concentrates</u>	<u>Bessemer</u>	<u>Non Bessemer</u>	<u>Total</u>
Hill		2,644	1,430	4,074
Hill Retreat		111,591	74,695	186,286
Trumbull Wash		8,689	42,243	50,932
Trumbull Retreat		27,548	118,837	146,385
Hill-Walker Retreat		39,833	87,330	127,163
Potter Retreat		1,780	10,384	12,164
Gross-Marble Retreat		<u>31,152</u>	<u>87,461</u>	<u>118,613</u>
		<u>223,237</u>	<u>422,380</u>	<u>645,617</u>

Hill-Walker Direct Ore	2,493
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b. Shipments

	<u>Concentrates</u>	<u>Bessemer</u>	<u>Non Bessemer</u>	<u>Total</u>
Hill		2,644	2,472	5,116
Hill Retreat		116,977	86,981	203,958
Trumbull Wash		8,764	67,467	76,231
Trumbull Retreat		35,134	144,621	179,755
Hill-Walker Retreat		43,532	95,287	138,819
Potter Retreat		1,780	10,384	12,164
Gross-Marble Retreat		<u>31,152</u>	<u>87,461</u>	<u>118,613</u>
		239,983	494,673	734,656
Hill-Walker Direct Ore				2,493

c. Stockpile Inventories

None

d. Production by Months

Month	<u>Crude</u>						Gross Marble	Total
	<u>Hill</u>			<u>Trumbull</u>				
	<u>Wash</u>	<u>Retreat</u>	<u>Walker Retreat</u>	<u>Wash</u>	<u>Retreat</u>	<u>Potter</u>		
April			51,423					51,423
May		21,604	185,168	16,324	4,353	45,407		272,856
June	8,273	306,433						314,706
July		321,363						321,363
Aug.		904		52,540	164,037		163,697	381,178
Sept.				7,954	328,154		79,291	415,399
Oct.			<u>175,320</u>	<u>15,518</u>			<u>101,275</u>	<u>292,113</u>
	<u>8,273</u>	<u>650,304</u>	<u>411,911</u>	<u>92,336</u>	<u>496,544</u>	<u>45,407</u>	<u>344,263</u>	<u>2,049,038</u>

<u>Concentrates</u>								
April			13,776					13,776
May		6,565	65,857	9,792	1,173	12,164		95,551
June	4,023	86,200		21				90,244
July		92,479						92,479
Aug.		1,042		28,910	46,115		43,511	119,578
Sept.				4,304	95,582		28,284	128,170
Oct.			46,412	7,024			46,818	100,254
Nov.	<u>51</u>	<u>1,118</u>	<u>1,118</u>	<u>881</u>	<u>3,515</u>			<u>5,565</u>
	<u>4,074</u>	<u>186,286</u>	<u>127,163</u>	<u>50,932</u>	<u>146,385</u>	<u>12,164</u>	<u>118,613</u>	<u>645,617</u>

Oct. 2,493 (Hill-Walker Direct Ore)

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3. ANALYSIS

a. Crude Ore

<u>Product</u>	<u>Tons</u>	<u>Iron</u>	<u>Silica</u>
✓ Hill ^{WASH} Retreat	8,273	44.41	33.01
Hill Retreat	650,304	39.06	40.68
Hill-Walker Retreat	411,911	42.51	35.44
Trumbull Line ^{WASH}	92,336	38.10	39.91
Trumbull Retreat	496,544	35.41	45.21
Potter Retreat	45,407	39.25	39.87
Gross-Marble Retreat	<u>344,263</u>	<u>36.69</u>	<u>43.84</u>
	2,049,038	38.46	41.17

b. Tonnage & Analysis of Concentrates Produced

<u>Product</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>	<u>Moisture</u>
✓ Hill Bessemer	2,644	59.22	.025	13.30	.10	.33	6.65
Hill Non Bessemer	1,430	58.06	.032	13.51	.11	.36	7.03
Hill Bessemer Retreat	111,591	58.33	.037	11.72	.18	.40	6.35
Hill Non Bessemer Retreat	74,695	58.55	.041	11.24	.16	.43	6.27
Trumbull Bessemer Line	8,689	56.21	.045	11.39	.16	.36	7.70
Trumbull Non Bessemer Line	42,243	56.61	.046	10.95	.15	.38	7.16
Trumbull Bessemer Retreat	27,548	58.48	.042	9.68	.17	.49	6.34
Trumbull Non Bessemer Retreat	118,837	57.93	.048	9.98	.17	.48	6.25
Hill-Walker Bessemer Retreat	39,833	60.20	.051	9.89	.17	.92	9.17
Hill-Walker Non Bess Retreat	87,330	59.51	.053	10.59	.17	.94	8.94
Potter Bessemer Retreat	1,780	56.75	.044	12.34	.19	.34	5.68
Potter Non Bessemer Retreat	10,384	56.47	.048	12.91	.19	.36	5.84
Gross-Marble Bessemer Retreat	31,152	58.47	.039	10.19	.16	.38	5.51
Gross-Marble Non Bess Retreat	<u>87,461</u>	<u>58.32</u>	<u>.044</u>	<u>9.87</u>	<u>.14</u>	<u>.43</u>	<u>5.38</u>
	645,617	58.40	.045	10.64	.17	.53	6.74
Hill-Walker Direct Ore	2,493	53.34	.074	16.68	.18	1.47	9.20

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c. Tonnage & Complete Analysis of Concentrates Shipped

<u>Product</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>	<u>Lime</u>	<u>Mag</u>	<u>Sulf</u>	<u>Ign Loss</u>	<u>Moist.</u>
Hill Bessemer	2,644	59.22	.025	13.30	.10	.33	.10	.15	.007	1.24	6.65
Hill Non Bessemer	2,472	58.11	.032	13.51	.11	.36	.10	.15	.007	2.56	6.72
Hill Bessemer Retreat	116,977	58.33	.037	11.72	.18	.40	.10	.15	.007	3.88	6.36
Hill Non Bess Retreat	86,981	58.39	.041	11.24	.16	.43	.10	.15	.007	4.26	6.39
Trumbull Bessemer Line	8,764	56.22	.045	11.38	.16	.36	.10	.15	.007	7.29	7.70
Trumbull Non Bess Line	67,467	57.01	.045	10.99	.16	.38	.10	.15	.007	6.53	7.07
Trumbull Bessemer Retreat	35,134	58.56	.042	9.56	.18	.49	.10	.15	.007	5.61	6.46
Trumbull Non Bess Retreat	144,621	57.94	.048	9.96	.17	.48	.10	.15	.007	6.11	6.43
Hill-Walker Bess Retreat	43,532	60.08	.051	9.89	.17	.92	.10	.15	.007	2.50	9.11
Hill-Walker Non Bess Ret.	95,287	59.51	.053	10.59	.17	.94	.10	.15	.007	2.76	8.84
Potter Bessemer Retreat	1,780	56.75	.044	12.34	.19	.34	.10	.15	.007	5.55	5.68
Potter Non Bess Retreat	10,384	56.47	.048	12.91	.19	.36	.10	.15	.007	5.35	5.84
Gross-Marble Bess Retreat	31,152	58.47	.039	10.19	.16	.38	.10	.15	.007	5.25	5.51
Gross-Marble N.B. Retreat	87,461	58.33	.044	9.87	.14	.43	.10	.15	.007	5.74	5.38
	734,656	58.35	.045	10.63	.17	.53	.10	.15	.007	4.81	6.81
Hill-Walker Direct Ore	2,493	53.34	.074	16.88	.18	1.47	.10	.15	.007	4.53	9.20

d. Mine Analysis of Ore in Stockpile

None

4. ESTIMATE of ORE RESERVES

a. Developed Ore - Factors Used

<u>Product</u>	<u>Cubic Feet Per Ton</u>	<u>Rock Deduction</u>	<u>Per Cent Recovery</u>
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

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b. Ore Reserves Estimated as of December 31, 1955

<u>Lease</u>	<u>Reserve 12-31-54</u>	<u>Mined 1955</u>	<u>Balance After Mining</u>	<u>Changed by Re-estimate</u>	<u>Reserve 12-31-55</u>
Trumbull	1,656,507	197,317	1,459,190	/ 129,440	1,588,630
Hill	1,018,414	190,360	828,054	/ 285,556	1,113,610
Hill-Walker	754,070	129,656	624,414		624,414
Potter	97,635	12,164	85,471		85,471
Gross-Marble		<u>118,613</u>	<u>- 118,613</u>	<u>/ 1,633,004</u>	<u>1,514,391</u>
	<u>3,526,626</u>	<u>648,110</u>	<u>2,878,516</u>	<u>/ 2,048,000</u>	<u>4,926,516</u>

c. Estimated Analyses of Ore Reserves

	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>
<u>Trumbull</u>						
Bessemer Wash Concentrates	26,933	57.61	.037	9.63	.10	.39
Non Bessemer Wash Concentrates	177,773	58.25	.053	9.73	.11	.56
Bessemer Retreat Concentrates	213,888	57.66	.036	10.70		
Non Bess Retreat Concentrates	<u>1,170,036</u>	<u>57.63</u>	<u>.055</u>	<u>10.67</u>		
	1,588,630	57.70	.052	10.55	.11	.54
<u>Hill</u>						
Non Bessemer Direct	63,317	60.05	.063	8.82		
Bessemer Wash Concentrates	264,930	62.38	.028	9.25	.11	.47
Non Bess Wash Concentrates	78,361	60.14	.053	10.74	.12	.36
Bessemer Retreat Concentrates	408,211	60.25	.034	10.55		
Non Bess Retreat Concentrates	<u>298,791</u>	<u>59.52</u>	<u>.052</u>	<u>10.48</u>		
	1,113,610	60.54	.041	10.14	.11	.45
<u>Hill-Walker</u>						
Non Bessemer Wash Concentrates	57,560	59.50	.045	11.30		
Non Bess Retreat Concentrates	<u>566,854</u>	<u>55.74</u>	<u>.051</u>	<u>13.37</u>		
	624,414	56.09	.050	13.18		
<u>Potter</u>						
Non Bessemer Retreat Concts.	85,471	56.62	.060	12.85		
<u>Gross-Marble</u>						
Bessemer Wash Concentrates	127,902	57.61	.037	9.63	.10	.39
Non Bess Wash Concentrates	670,552	58.25	.053	9.73	.11	.56
Bessemer Retreat Concentrates	306,244	57.66	.036	10.70		
Non Bess Retreat Concentrates	<u>409,693</u>	<u>57.63</u>	<u>.055</u>	<u>10.67</u>		
	1,514,391	57.91	.048	10.17	.11	.53

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<u>Totals</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>
<u>Total Direct Ore</u>	63,317	60.05	.063	8.82		
Bessemer Wash Concentrates	419,765	60.62	.031	9.39	.10	.44
<u>Non Bess Wash Concentrates</u>	<u>984,246</u>	<u>58.47</u>	<u>.053</u>	<u>9.90</u>	<u>.11</u>	<u>.55</u>
Total Wash Concentrates	1,404,011	59.11	.046	9.75	.11	.52
Bessemer Retreat Concentrates	928,343	58.80	.035	10.63		
<u>Non Bess Retreat Concentrates</u>	<u>2,530,845</u>	<u>57.40</u>	<u>.054</u>	<u>11.33</u>		
Total Retreat Concentrates	3,549,188	57.78	.049	11.14		
Total Bessemer Concentrates	1,348,108	59.37	.034	10.24	.10	.44
<u>Total Non Bess Concentrates</u>	<u>3,578,408</u>	<u>57.74</u>	<u>.054</u>	<u>10.89</u>	<u>.11</u>	<u>.55</u>
Total Hill-Trumbull Mine	4,926,516	58.19	.049	10.71	.11	.51

5. LABOR & WAGES

a. Comments

An ample labor supply prevailed in 1955. All men laid off in 1953 and not called back in 1954 were recalled for the 1955 ore season.

A wage increase of \$0.115 per hour plus \$0.005 per job class was granted on July 1, 1955.

Company-union relations continued on a satisfactory basis.

b. Comparative Statement of Production & Wages

Product	648,110
Number of 8-hour shifts.	2
Average number of men working.	166
Average wages per day.	\$20.52
Product per man per day.	25.05
Labor cost per ton	\$0.815
Total number of days worked.	152
Amount paid for labor.	\$528,075.45

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6. GENERAL SURFACE

a. Building & Repairs

Houses and other buildings were repaired and painted as required. Conversion from coal to oil was completed in the office, chemical laboratory, and shop furnaces.

b. Roads, Transmission Lines, Tracks & Construction

No major road changes were made during the year. A power line was constructed from the plant to the tailings basin to be used for dyke work and, with an extension, will be used for pumping clear water back to the plant.

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

Because the Highway Department will widen Highway 169, the present bridge was dismantled at the end of the ore season and construction of a new bridge was started with completion scheduled before the 1956 ore season.

7. OPEN PIT

a. Stripping

No stripping was in progress at the start of the 1955 season. Cleanup of a small amount of surface from the north bank of the Trumbull was begun on April 18 and consisted of cleanup of the bank slough along the roads leading to the Hill-Walker pit and to the Hill rock dump. This work was completed on April 22 with a total of 7,488 cubic yards moved.

Following the close of mining operations in October, two shovels were moved into the Hill-Walker lease for stripping. Three crews worked on a 40-hour, 15-shift-per-week schedule stripping from the north and east sides. Upon completion of Hill-Walker stripping, shovels were moved to the Gross-Marble and Potter leases; the work schedule remained the same, but the project was reduced to a one-shovel operation. Stripping was slowed down from the Gross-Marble because of a longer haul road with numerous sharp curves. The Gross-Marble program

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consisted of stripping the northwest corner of the property to the Oliver line; Potter stripping consisted of widening the existing area to the west. Upon completion of Gross-Marble and Potter stripping, the shovels were moved to the Hill-Trumbull rock dump located in the Hill pit. The remainder of the stripping program consisted of the transfer of rock from the pit rock dump to the rock dump north of the pit. Stripping and rock removal were completed on December 30 with a total of 613,422 cubic yards stripped.

The original stripping program under E&A No. MC-277 did not include Gross-Marble stripping or rock removal from the Hill-Trumbull. A decision on these projects was reached after the Gross-Marble lease was acquired.

Shift production averaged 4,719 cubic yards at an average cost of \$0.250 per yard, \$0.006 above the original budget but \$0.019 below the revised budget which included Gross-Marble stripping and Hill-Trumbull rock dump removal.

Stripping removed in 1955 is shown as follows:

<u>Lease</u>	<u>Cubic Yards</u>		
	<u>Surface</u>	<u>Rock</u>	<u>Total</u>
Hill-Walker	435,378		435,378
Potter	62,178		62,178
Gross-Marble	43,918		43,918
Hill-Trumbull Rock Dump		<u>71,948</u>	<u>71,948</u>
	<u>541,474</u>	<u>71,948</u>	<u>613,422</u>

b. Open Pit Mining

The 1955 ore season started on April 25 on a 2-shift, 5-day-week schedule which was maintained until July 5 when operations were increased to a 2-shift, 6-day-per-week schedule until the end of ore season on October 26. Two to three shovels and eight to ten trucks were used under normal operating conditions.

2,394,278 tons of crude ore plus 2,853 tons of cretaceous ore, for a total of 2,397,131 tons, were produced in 162.5 days at an average rate of 7,376 tons per shift. From the crude ore, 345,240 tons of 4" waste rock were screened out in the pit

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and the balance of 2,049,038 tons sent to the plants at an average rate of 6,718 tons per shift; from the cretaceous ore, 360 tons of 4" material were screened out in the pit and the balance of 2,498 tons loaded into railroad cars for direct shipment.

Screen rock made up 14.43 per cent of the total crude, .80 per cent of the wash crude, 15.02 per cent of the retreat, and 12.63 per cent of the direct ore. Rock percentage in the wash ore increased .11 per cent above the previous year; in the retreat, .52 per cent; no direct ore was mined in 1954, giving a combined total increase of .77 per cent over the 1954 season. A progressive increase in the amount of screen rock handled has been shown in the past several years.

As in the past several years, retreat crude ore constituted a major portion of the pit production, totalling 2,292,859 tons as compared with 101,419 tons of washed crude ore and 2,853 tons of direct ore before screening.

Following is the tonnage produced from the various leases:

<u>Lease</u>	<u>Tons Retreat Crude</u>	<u>Area From Which Produced</u>
Hill-Walker	502,751	By enlarging pit on all sides.
Hill	767,814	North side and scam area.
Trumbull	576,974	Area leading to Gross-Marble; slough area on south; southeast corner.
Gross-Marble	376,633	Center and north side.
Potter	<u>68,687</u>	Southeast corner.
	<u>2,292,859</u>	

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Wash ore was produced from the Trumbull-Delaware No. 2 trespass and a small tonnage from the north side of the Hill lease; a small amount of direct ore was mined from the upper cretaceous layer on the north side of the Hill-Walker 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 107,580 tons which combined with 18,540 cubic yards (27,810 tons) of sand and waste cleanup gave a total of 135,390 tons of waste material moved from the mine during the operating season.

Mining conditions during the 1955 operating season were generally satisfactory and normal with only a few heavy rains and average equipment breakdowns.

c. Pumping & Drainage

Pit pumping remained the same as the previous season. The Oliver Iron Mining Division did not work the Delaware No. 2 lease, so the Hill-Trumbull had to do most of the pumping. After the Hill-Trumbull took over the Gross-Marble lease, the Oliver continued pumping in the Gross-Marble to keep its screening plant free of water.

Water was still pumped 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 scrambling. Except for pit rock and sand cleanup, there was no movement of waste or lean ore.

8. BENEFICIATION

a. Washing Plant

Operation of the washing plant started on April 25 with a 2-shift, 5-day-week in effect. On July 5, this operation was increased to 12 shifts a week and remained in effect until the end of the season on October 26.

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Some Sunday work was also scheduled intermittently toward the end of the season to help meet increased tonnage requirements.

During the season, the washing plant operated 307 shifts treating 100,609 tons of wash ore crude and 1,948,429 tons of re-treat crude for a total of 2,049,038 tons of crude ore treated. The plant produced 55,006 tons of washed concentrates at an average recovery of 54.67 per cent and 890,072 tons of Heavy-Media feed at an average recovery of 45.68 per cent. The scalped 42" material amounted to 9.29 per cent of the retreat crude ore, a reduction from the previous season. The net feed rate of crude to the washing plant averaged 880.22 tons per hour, reflecting an increase of nearly 51 tons per hour (or 6.13 per cent) over that of the previous season.

Because of a decreased maintenance program, it was gratifying that washing plant delays did not exceed 5.22 per cent of the total operating time, a slight increase over the previous year.

Following is a brief summary of delay time:

<u>Source of Delay</u>	<u>Hours</u>	<u>Per Cent</u>	<u>Per Cent of 2456.0 Working Hours</u>
Out of Ore	74.62	58.24	3.04
Crude Ore Pocket	1.50	1.17	0.06
8' Pan Conveyor	12.33	9.62	0.50
Crude Ore Conveyor	6.67	5.21	0.27
Primary Screens	0.92	0.72	0.04
Crusher Discharge Belts	0.42	0.33	0.02
Secondary Screens	10.75	8.39	0.45
Surge Pile Feed Belt	0.50	0.39	0.02
Surge Pile Full	2.00	1.56	0.08
Spiral Classifiers	0.50	0.39	0.02
Tailings Pump	10.25	8.00	0.42
Tailings Line	1.33	1.04	0.05
Waiting for Rock Truck	2.17	1.69	0.09
Misc. Chutes & Launderers	1.08	0.84	0.04
Clear Water Valve	1.75	1.37	0.07
Electric Power	<u>1.33</u>	<u>1.04</u>	<u>0.05</u>
	<u>128.12</u>	<u>100.00</u>	<u>5.22</u>

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Recapitulation

<u>Source of Delay</u>	<u>Hours</u>	<u>Per Cent</u>	<u>Per Cent of 2456.0 Working Hours</u>
Ore to Head of Mill	95.12	74.24	3.87
Ore Processing Delays	<u>33.00</u>	<u>25.76</u>	<u>1.35</u>
	128.12	100.00	5.22

- b. Retreat plant operations began on April 25 on the same schedule as the washing plant. The retreat plant operated on feed from the surge pile during periods when the washing plant was down for repairs or processing wash ore crude. From 890,072 tons of Heavy-Media feed, 426,866 tons of Heavy-Media concentrates were produced at a weight recovery of 48.07 per cent. 1,948,429 tons of retreat crude delivered to the washing plant produced 590,611 tons of retreat concentrates at a weight recovery of 30.31 per cent.

The over-all grade of Heavy-Media concentrates and retreat concentrates was about the same as 1954 with a slight improvement in silica. Finer crushing, scalping of lean $\frac{1}{2}$ " material, and improved cyclone plant performance contributed toward a concentrate grade within the established estimate.

There were no major mechanical delays in the Heavy-Media plant during the season, the largest single item of delay being out of ore. Over-all delay time of the plant was down appreciably from the previous season. Following is a brief summary of delay time:

<u>Source of Delay</u>	<u>Hours</u>	<u>Per Cent</u>	<u>Per Cent of 2370.0 Working Hours</u>
Out of Ore	38.50	61.43	1.62
Processing Wash Ore	6.00	9.57	0.25
Surge Pile Feeder	5.00	7.98	0.22
Heavy Density Feed Conveyor	0.50	0.80	0.02
Feed Prep Screen	0.50	0.80	0.02
Wash & Drain Screens	1.00	1.60	0.04

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<u>Source of Delay</u>	<u>Hours</u>	<u>Per Cent</u>	<u>Per Cent of 2370.0 Working Hours</u>
Pumps	2.83	4.52	0.12
Magnetic Separators	1.25	1.99	0.05
Densifier	0.67	1.07	0.03
Rock Pocket & Chute	1.00	1.60	0.04
Waiting for Rock Truck	2.42	3.85	0.11
Plant Tieup	2.00	3.19	0.08
Electric Power	<u>1.00</u>	<u>1.60</u>	<u>0.04</u>
	62.67	100.00	2.64

Recapitulation

Ore to Head of Mill	50.00	79.78	2.11
Ore Processing Delays	<u>12.67</u>	<u>20.22</u>	<u>0.53</u>
	62.67	100.00	2.64

Concentrating data for the washing and retreat plants is as follows:

<u>Washing Plant Product</u>	<u>Tons</u>	<u>Per Cent Weight</u>		<u>Per Cent</u>			
		<u>Plant</u>	<u>Pit</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Iron Units*</u>
Crude to Plant	100,609	100.00	99.11	38.62		39.64	
Pit Rock	90		.09	31.10		50.60	
Screen Plant Rock	810		.80	26.89		55.90	
Pit Crude	101,509		100.00	38.52		39.48	
Concentrates Produced	54,074	53.75	53.27	56.53	.044	11.30	78.66
Stockpile Overrun	932	.93	.92				
<u>Total</u>							
Concts Produced & Shipped	55,006	54.67	54.19	56.53	.044	11.30	80.01
Fine Tailings (by difference)	45,603	45.33	44.92	17.02		73.16	

*Iron Unit Recovery Calculated on Plant Basis

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Retreat Plant Product	Tons	Per Cent Weight		Per Cent			Iron Units*
		Plant	Pit	Iron	Phos	Silica	
Crude to Plant	1,948,429	100.00	81.17	38.45		41.27	
Pit Rock	107,490		4.48	25.98		58.31	
Screen Plant Rock	344,430		14.35	25.05		59.52	
Pit Crude	2,400,349		100.00	35.97		44.65	
Concentrates Produced	577,085	29.62	24.04	58.62	.044	10.57	45.15
Stockpile Overrun	13,526	.69	.56				
<u>Total</u>							
Conc'ts Produced & Shipped	590,611	30.31	24.61	58.63	.044	10.56	46.22
Heavy-Media Concentrates	427,866	21.96	17.83	58.87		10.04	
Heavy-Media Rejects	462,206	23.72	19.25	27.38		57.46	
Heavy-Media Feed	890,072	45.68	37.08	42.52		34.64	
1/2" Wash Plant Rejects	180,991	9.29	7.54	26.68		58.56	
Total Fine Tails(by difference)	714,621	36.68	29.77	31.91		51.80	

*Iron Unit Recovery Calculated on Plant Basis

- c. The cyclone plant followed the same operating schedule as the washing and retreat plants. Because of flowsheet changes effected before the start of the ore season, operation of the plant was decidedly improved over any previous season. Some difficulty was encountered with media structure inasmuch as different blends of varied structure media were being tested; however, toward the end of the season information gained in this respect solved the problem and operation continued smoothly.

On a calculated basis, 226,542 tons of cyclone feed sent to the plant produced 156,762 tons of concentrates at an average weight recovery of 69.20 per cent, slightly over that of last year. Concentrate grade was decidedly improved and feed rate tonnages were up approximately 20 per cent.

Separate shipment of coarse and fine concentrates was practiced for the first time this season on a portion of the mine production. Cyclone concentrate was stockpiled and subsequently loaded out separately, while the coarser Heavy-Media concentrate was loaded into cars as it was produced.

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Out of ore was the largest single delay item; mechanical delays were minor.

Following is a brief summary of delay time:

<u>Source of Delay</u>	<u>Hours</u>	<u>Per Cent</u>	<u>Per Cent of 2275.0 Working Hours</u>
Out of Ore	38.08	60.13	1.67
Processing Wash Ore	6.00	9.47	0.26
Cyclone Feed Pump-Rock Spill	3.50	5.53	0.15
North Tramp Pump	4.00	6.32	0.18
North Tramp Screen	4.00	6.32	0.18
Thickeners	0.75	1.18	0.03
Concentrate Classifier	0.25	0.39	0.01
Adjust Gravity	<u>6.75</u>	<u>10.66</u>	<u>0.30</u>
	63.33	100.00	2.78

Recapitulation

Ore to Head of Mill	44.08	69.60	1.93
Ore Processing Delays	<u>19.25</u>	<u>30.40</u>	<u>0.85</u>
	63.33	100.00	2.78

9. MAINTENANCE & REPAIRS

A limited repair program was started in the plants on March 1 and in the shops on April 4. Following the close of ore season, churn drill repair and some dumpcar repair was done. Because stripping continued until the end of the year, shovel and truck repair will be carried on after January 1, 1956.

Following the close of the 1955 ore season, all plants were cleaned out and the normal winter repair program was carried on until the end of the year.

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10. COST of OPERATION

a. Comparative Mining Costs

<u>Product</u>	<u>1955</u>		<u>1954</u>
	<u>Budget</u>	<u>Year</u>	<u>Year</u>
Direct Shipping Ore		2,493	
Washing Plant Concentrates	20,000	55,006	47,042
Retreat Plant Concentrates	<u>595,000</u>	<u>590,611</u>	<u>346,780</u>
	615,000	648,110	393,822
Per Cent Recovery		26.60	28.71
Average Daily Output		4,263	4,230
Tons Per Man Per Day		25.05	29.34
Days Operated		152	93
<u>Costs</u>			
Pit Operating	\$0.260	\$0.222	\$0.283
Concentrating	0.258	0.262	0.225
Loading Stockpile Ore	0.025	0.024	0.014
General Mine Expense	0.163	0.186	0.434
Winter & Idle	<u>0.499</u>	<u>0.474</u>	<u>1.119</u>
Cost of Production	<u>\$2.667</u>	<u>\$2.512</u>	<u>\$3.337</u>
<u>Depreciation</u>			
Plant & Equipment		0.059	0.114
Motorized Equipment		0.104	0.103
Movable Equipment		0.006	0.007
<u>Amortization</u>			
Defense Facilities		0.184	0.290
Stripping		0.000	0.000
<u>Taxes</u>			
Ad Valorem		0.188	0.248
Occupational		0.293	0.119
Royalty		<u>0.224</u>	<u>0.163</u>
<u>Total</u>			
Depreciation, Amortization, Taxes		\$1.058	\$1.044

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<u>Costs</u>	<u>Year</u>	
	<u>1955</u>	<u>1954</u>
Administrative Expense	\$0.100	\$0.100
Miscellaneous Expense & Income	-0.004	0.011
Royalty	1.493	
Total Cost at Mine	\$5.159*	\$4.492*

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

b. Detailed Cost Comparison

Pit Operating cost was \$0.038 below the budget and \$0.061 below 1954 costs. Cost of blasting was \$0.005 below the budget and \$0.031 below 1954 costs due to the use of Akremite, a new blasting powder. The Truck Rental and Leased Trucks item was \$0.015 below the budget and \$0.031 below 1954 costs due to a credit received when trucks were placed on a 4-year rental basis instead of a 3-year basis. Considering the increase in wages in July, the 1955 costs compare favorably with 1954 costs.

Beneficiation costs were \$0.004 above the budget and \$0.037 above 1954 costs. The Concentrating-Maintenance item and the Media item were slightly higher than the budget. The Concentrating-Maintenance item was \$0.008 higher than the budget due to the purchase of conveying equipment from the Agnew mine to extend the rock reject stacking system. The Process Royalty item was \$0.006 higher than the estimated budget.

Loading stockpile ore was very close to the budget, but \$0.010 higher than 1954 as more ore was loaded than in the previous season.

General Mine expense was \$0.023 higher than the budget but \$0.248 below the 1954 season, the reduction being effected by the increased tonnage.

Winter & Idle expense was \$0.025 below the budget and \$0.645 below the 1954 costs. Increased tonnage and curtailment of repairs reduced expenses considerably as compared to the previous season.

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Cost of Production was \$0.155 lower than the budget and \$0.825 lower than the 1954 costs due to increased tonnage and decreased Winter & Idle expense.

11. EXPLORATION & FUTURE EXPLORATION

The drilling program was discontinued in 1955. A re-estimate of reserves for setting minimums in 1957 for the Great Northern leases may initiate a limited drilling program.

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.

Hill-Walker drilling is fairly complete although some additional holes should be drilled along the south line to determine final limits.

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

The newly acquired Gross-Marble forty will require more exploration work on the south side.

12. TAXES

	<u>1955</u>		<u>1954</u>		<u>Increase-Decrease</u>	
	<u>Assessed Value</u>	<u>Taxes</u>	<u>Assessed Value</u>	<u>Taxes</u>	<u>Assessed Value</u>	<u>Taxes</u>
Mineral	\$211,261	\$ 38,396.69	\$234,144	\$39,366.63	-\$22,883	-\$ 969.94
Land, Bldg, Mach	141,989	32,291.37	141,989	30,719.26		1,572.11
<u>Personal Property</u>						
Equipment	154,379	28,088.40	141,655	23,848.22	12,724	4,240.18
Stockpile	8,652	1,572.50	2,309	388.21	6,343	1,184.29
	<u>\$516,281</u> ✓	<u>\$100,348.96</u> ✓	<u>\$520,097</u> ✓	<u>\$94,322.32</u> ✓	<u>-\$ 3,816</u>	<u>\$6,026.64</u>
Average Mill Rate		194.35 ✓		181.36 ✓		✓ 7.16%

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Revised estimate increased reserve developed retreat ore but reduced merchantable wash concentrate tonnage, giving an over-all reduction in assessed mineral value.

Equipment value increased by flat 10 per cent by orders of State Commissioner of Taxation.

81,884 tons of concentrate stockpiled ore on hand in 1955; none in 1954. Lean ore stockpile in pit same tonnage in 1954 and 1955.

Tax Commission Reserve

	<u>Tons</u>		<u>Increase</u>
	<u>1955</u>	<u>1954</u>	
May 1	3,927,846	3,485,251	442,595

Note: Above figures do not include any tonnage or value on Gross-Marble taken after July 1.

13. ACCIDENTS & PERSONAL INJURY

<u>Name</u>	<u>Date of Injury</u>	<u>Nature of Injury</u>	<u>Cause</u>	<u>Time Lost</u>	<u>Compensation Paid</u>
Harold Bundy, Sr.	8-16-55	Foreign object in right eye.	While burning steel plate, piece of slag entered under goggles into right eye.	4 Weeks 3 Days	\$180
Fred Hodgman	11-2-55	Bruised left foot.	While moving truck tire across shop floor, tire fell striking left leg and foot.	1 Week 3 Days	\$ 64

14. PROPOSED NEW CONSTRUCTION

New bridge over Highway 169.

Extension of rock reject belt at the mill.

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15. EQUIPMENT RECEIVED & PROPOSED NEW EQUIPMENT

a. New Equipment Received

- ✓2 Jeffrey Separators
- ✓2 Dings Separators
- ✓1 Caterpillar Grader
- ✓1 1/2-Ton Ford Pickup
- 2 Electric Water Heaters
- 3 Fan Unit Heaters
- 1 Malsbury Steam Cleaner
- 2 35-Ton Buda Jacks
- 1 Duff Norton Jack
- 2 Ingersol-Rand Impact Tool
- 1 Hydraulic Puller Set
- 1 Heavy Duty Hydraulic Puller Set
- 1 Automatic Fire Protection for Pit Tunnel
- 1 8x6 Allis-Chalmers Pump
- 1 Gearmotor - 2 Horsepower
- 1 100-Ton Loading Pocket

Belting

- 916' 24" Conveyor (Agnew)
- 150' 30" Conveyor (U.S.)
- 20' 30" Conveyor (Goodyear)
- 532' 36" Conveyor (U.S.)

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Furnaces

- 1 Oil Furnace for Office
- 1 Oil Furnace for Plant Dry
- 1 Oil Furnace for Shop
- 1 Oil Furnace for House #8
- 1 Tank for Shop (10,000 Gallons)

b. Proposed New Equipment

- 1 D-8 Caterpillar Tractor
- 1 Service Truck
- 2 3/4-Ton Pickups
- 1 300-horsepower Motor
- 1 Fuel Tank (10,000 Gallons)
- 2 Fluid Couplings
- 1 6" Pump

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b. Proposed New Equipment

2 Cyclone Concentrate Screens
1 Dings Magnetic Separator 36x36

841' 36" Conveyor Belting
940' 30" Conveyor Belting

HOLMAN-CLIFFS MINEANNUAL REPORTYEAR 19551. GENERAL

The Holman-Cliffs mine was on a standby basis from the first of the year until March 1. Six hourly employees were carried—five as stationary firemen and one as a tractor operator for snow plowing and miscellaneous work. The heating plants furnished heat for the District ore test laboratory and the central warehouse. Salaried foremen were scheduled on all shifts as property watchmen. Automatic pumping of pit water continued steadily. A small crew started in the concentrating plants on March 1 on necessary repairs to equipment; shop crews began April 1 on repairs to shovels; loading of concentrates from stockpile got under way on April 21; loading of crude ore from the pit and concentrating in the pit plant began at 7:00 a.m. on April 25; Lake Concentrator operations started at 7:00 a.m. on May 2.

Upon completion of the ore season at 11:00 p.m. on October 26, pit crews were engaged in stripping for the balance of the year. Crews were maintained in plants and shops for necessary repairs to equipment until the first of the year.

Operating conditions throughout the year were normal and no serious delays were experienced.

2. PRODUCTION-INVENTORIES-SHIPMENTSa. Production by Grades

	<u>Crude</u>	<u>Wash</u>	<u>Retreat</u>	<u>Total</u>
Holman		51,054	509,660	560,714
Brown		6,582	671,472	678,054
North Star		98,304	358,531	456,835
Holman Lake			390,742	390,742
Brown Lake			55,649	55,649
		<u>155,940</u>	<u>1,986,054</u>	<u>2,141,994</u>

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<u>Concentrates</u>	<u>Bessemer</u>		<u>Non Bessemer</u>		<u>Total</u>
	<u>Wash</u>	<u>Retreat</u>	<u>Wash</u>	<u>Retreat</u>	
Holman	20,721	139,690	9,575	129,551	299,537
Brown	60	45,794	3,970	289,908	339,732
North Star	48,292	181,292	24,896	29,460	283,940
Holman Lake		47,587		114,987	162,574
Brown Lake		7,973		11,306	19,279
	<u>69,073</u>	<u>422,336</u>	<u>38,441</u>	<u>575,212</u>	<u>1,105,062</u>

b. Shipments

Holman	21,508	143,292	9,459	137,088	311,347
Brown	860	69,991	1,586	229,500	301,937
North Star	48,292	166,255	24,896	36,058	275,501
Holman Lake		47,587		114,987	162,574
Brown Lake		7,973		11,306	19,279
	<u>70,660</u>	<u>435,098</u>	<u>35,941</u>	<u>528,939</u>	<u>1,070,638</u>

c. Inventories

	<u>Wash</u>	<u>Retreat</u>	<u>Total</u>
Holman	128	2,977	3,105
Brown	2,384	72,522	74,906
North Star		21,596	21,596
	<u>2,512</u>	<u>97,095</u>	<u>99,607</u>

d. Production by Months Crude Ore

<u>Month</u>	<u>Holman</u>		<u>Brown</u>		<u>North Star</u>		<u>Holman Lake</u>	<u>Brown Lake</u>	<u>Total</u>
	<u>Wash</u>	<u>Retreat</u>	<u>Wash</u>	<u>Retreat</u>	<u>Wash</u>	<u>Retreat</u>	<u>Retreat</u>	<u>Retreat</u>	
April				15,946	13,135	21,856			50,937
May			194	129,094	25,216	70,520	39,821	18,998	283,843
June	3,603			122,453	28,270	104,862	52,702	16,600	328,490
July	11,956	8,469	917	120,202	24,552	89,821	50,746	20,051	326,714
Aug	19,081	112,438	4,515	131,180	7,131	48,018	80,239		402,602
Sept	10,293	193,678	956	113,855			90,977		409,759
Oct	6,121	195,075		38,742		23,454	76,257		339,649
	<u>51,054</u>	<u>509,660</u>	<u>6,582</u>	<u>671,472</u>	<u>98,304</u>	<u>358,531</u>	<u>390,742</u>	<u>55,649</u>	<u>2,141,994</u>

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Concentrates

Month	Holman		Brown		North Star		Holman Lake	Brown Lake	Total
	Wash	Retreat	Wash	Retreat	Wash	Retreat	Retreat	Retreat	
April				8,010	8,497	9,911			26,418
May			113	61,179	18,391	41,155	20,239	7,399	148,476
June	2,160			62,421	21,099	63,223	24,340	5,349	178,592
July	7,758	4,430	596	65,063	19,565	55,724	23,860	6,531	183,527
Aug	11,075	58,787	2,777	66,058	5,636	27,444	30,909		202,686
Sept	5,814	106,144	544	54,738			31,554		198,794
Oct	3,489	99,880		18,233		13,295	31,672		166,569
	30,296	269,241	4,030	335,702	73,188	210,752	162,574	19,279	1,105,062

3. ANALYSIS

a. Tonnage & Analysis of Crude Ore Produced

Product	Tons	Iron	Silica
<u>Holman</u>			
Wash	51,054	42.74	34.32
Retreat	509,660	40.79	36.77
Lake Retreat	390,742	45.40	29.27
<u>Brown</u>			
Wash	6,582	43.31	31.51
Retreat	671,472	39.56	38.69
Lake Retreat	55,649	39.94	38.20
<u>North Star</u>			
Wash	98,304	48.98	25.04
Retreat	358,531	45.70	30.08
	2,141,994	42.49	34.31

b. Tonnage & Analysis of Concentrates Produced

Product	Tons	Iron	Phos	Silica	Mang	Alum	Moisture
<u>Holman</u>							
Bessemer	20,721	57.69	.033	11.35	.17	.37	6.19
Non Bessemer	9,575	57.90	.039	10.88	.18	.32	6.12
Bessemer Retreat	139,690	57.91	.034	11.18	.17	.39	6.23
Non Bessemer Retreat	129,551	57.70	.046	10.79	.17	.38	5.96

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<u>Product</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>	<u>Moisture</u>
<u>Brown</u>							
Bessemer	60	58.70	.044	10.20	.22	.42	5.90
Non Bessemer	3,970	56.77	.055	10.80	.24	.43	6.55
Bessemer Retreat	45,794	57.40	.038	11.82	.19	.42	6.37
Non Bessemer Retreat	289,908	56.84	.051	12.09	.21	.36	6.14
<u>North Star</u>							
Bessemer	48,292	57.01	.029	12.11	.21	.39	7.32
Non Bessemer	24,896	57.47	.037	11.49	.21	.38	7.10
Bessemer Retreat	181,292	58.16	.033	11.26	.24	.37	6.72
Non Bessemer Retreat	29,460	58.09	.041	10.49	.29	.37	6.69
<u>Holman Lake</u>							
Bessemer Retreat	47,587	54.96	.043	14.64	.20	.42	6.60
Non Bessemer Retreat	114,987	55.03	.043	14.50	.20	.48	6.75
<u>Brown Lake</u>							
Bessemer Retreat	7,973	55.94	.039	13.61	.23	.38	8.56
Non Bessemer Retreat	11,306	55.64	.044	14.49	.23	.51	7.69
	<u>1,105,062</u>	<u>57.11</u>	<u>.041</u>	<u>11.99</u>	<u>.20</u>	<u>.39</u>	<u>6.44</u>

c. Tonnage & Complete Analysis of Concentrates Produced & Shipped

<u>Product</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mn</u>	<u>Alum</u>	<u>Lime</u>	<u>Mag</u>	<u>Sulf</u>	<u>Ign Loss</u>	<u>Moist</u>
<u>Holman</u>											
Bessemer	21,508	57.66	.033	11.38	.17	.38	.10	.16	.016	5.20	6.17
Non Bessemer	9,459	57.92	.039	10.85	.18	.32	.10	.16	.016	5.39	6.10
Bessemer Retreat	143,292	57.88	.033	11.25	.17	.40	.10	.16	.016	5.00	6.22
Non Bessemer Retreat	137,088	57.68	.046	10.80	.17	.38	.10	.16	.016	5.72	5.88
<u>Brown</u>											
Bessemer	860	57.84	.036	12.53	.15	.31	.10	.16	.016	3.89	5.53
Non Bessemer	1,586	57.25	.060	8.82	.26	.42	.10	.16	.016	8.12	5.90
Bessemer Retreat	69,991	57.34	.036	12.23	.18	.40	.10	.16	.016	4.77	6.25
Non Bessemer Retreat	229,500	56.77	.052	12.13	.21	.36	.10	.16	.016	5.57	6.06

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<u>Product</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>	<u>Lime</u>	<u>Mag</u>	<u>Sulf</u>	<u>Ign Loss</u>	<u>Moist</u>
<u>North Star</u>											
Bessemer	48,292	57.01	.029	12.11	.21	.39	.10	.16	.016	5.34	7.32
Non Bessemer	24,896	57.47	.037	11.49	.21	.38	.10	.16	.016	5.30	7.10
Bessemer Retreat	166,255	58.15	.033	11.20	.24	.37	.10	.16	.016	4.61	6.69
Non Bessemer Retreat	36,058	57.93	.042	10.64	.30	.36	.10	.16	.016	5.37	6.61
<u>Holman Lake</u>											
Bessemer Retreat	47,587	54.96	.043	14.64	.20	.42	.10	.16	.016	5.70	6.60
Non Bessemer Retreat	114,987	55.03	.043	14.50	.20	.48	.10	.16	.016	5.68	6.75
<u>Brown Lake</u>											
Bessemer Retreat	7,973	55.94	.039	13.61	.23	.38	.10	.16	.016	5.33	8.56
Non Bessemer Retreat	11,306	55.64	.044	14.49	.23	.51	.10	.16	.016	4.74	7.69
	<u>1,070,638</u>	<u>57.10</u>	<u>.041</u>	<u>12.00</u>	<u>.20</u>	<u>.39</u>	<u>.10</u>	<u>.16</u>	<u>.016</u>	<u>5.31</u>	<u>6.40</u>

d. Mine Analysis of Ore in Stockpile

<u>Product</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>	<u>Moisture</u>
Holman Wash	128	56.60	.021	14.05	.16	.40	7.40
Holman Retreat	2,977	54.26	.033	16.85	.15	.42	8.84
Brown Wash	2,384	56.45	.051	12.12	.23	.44	6.98
Brown Retreat	72,522	57.11	.047	12.01	.19	.37	6.47
North Star Retreat	<u>21,596</u>	<u>58.12</u>	<u>.032</u>	<u>11.93</u>	<u>.22</u>	<u>.38</u>	<u>6.89</u>
	<u>99,607</u>	<u>57.23</u>	<u>.043</u>	<u>12.14</u>	<u>.20</u>	<u>.38</u>	<u>6.65</u>

4. ESTIMATE of ORE RESERVES

a. Developed Ore - Factors Used

<u>Concentrates</u>	<u>Cubic Feet Per Ton</u>	<u>Rock Deduction</u>	<u>Per Cent Recovery</u>
Merch	14	0	100
Wash	14	0	58
Lean Wash	14	0	48
Low Grade Wash	14	0	58
Lean Low Grade Wash	14	0	45
Retreat	14	0	40

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<u>Lease</u>	<u>Reserve</u> <u>12-31-54</u>	<u>Mined</u> <u>1955</u>	<u>Balance</u> <u>after Mining</u>	<u>Changed by</u> <u>Re-estimate</u>	<u>Reserve</u> <u>12-31-55</u>
<u>North Star</u>					
N $\frac{1}{2}$ -NE 21-56-24	692,105	283,940	408,165		408,165
<u>Bingham</u>					
NW-SE 21-56-24	1,533,233		1,533,233		1,533,233
<u>Holman</u>					
SE-NE 21-56-24	1,322,947	299,537	1,023,410		1,023,410
<u>Brown No. 1</u>					
SW-NE 21-56-24	418,684		418,684		418,684
<u>Brown No. 2</u>					
SW-NW 22-56-24	<u>2,315,393</u>	<u>339,732</u>	<u>1,975,661</u>		<u>1,975,661</u>
	6,282,362	923,209	5,359,153		5,359,153

<u>Product</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>
<u>North Star</u>						
Bessemer Wash Concentrate	116,205	58.42	.023	10.51	.16	.40
Non Bessemer Wash Concentrate	130,667	53.82	.050	11.12	.28	.40
Bessemer Retreat Concentrate	57,190	55.81	.024	11.18		
Non Bessemer Retreat Concentrate	<u>104,103</u>	<u>55.76</u>	<u>.048</u>	<u>10.99</u>		
	408,165	55.90	.038	10.92	.20	.40
<u>Bingham</u>						
Non Bessemer Merch	53,259	57.98	.051	11.83		
Bessemer Wash Concentrate	516,528	58.39	.031	11.34	.16	.49
Non Bessemer Wash Concentrate	281,237	57.98	.049	11.06	.51	.44
Bessemer Retreat Concentrate	272,782	57.21	.034	12.03		
Non Bessemer Retreat Concentrate	<u>409,427</u>	<u>57.83</u>	<u>.047</u>	<u>12.20</u>		
	1,533,233	57.94	.040	11.66	.28	.47
<u>Holman</u>						
Bessemer Wash Concentrate	730,239	57.87	.029	10.91	.16	.43
Non Bessemer Wash Concentrate	272,657	56.63	.056	12.06	.17	.48
Bessemer Retreat Concentrate	<u>20,514</u>	<u>56.70</u>	<u>.026</u>	<u>12.15</u>		
	1,023,410	51.52	.036	11.24	.16	.44

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<u>Product</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>
<u>Brown No. 1</u>						
Bessemer Wash Concentrate	153,549	58.32	.033	11.21	.28	.36
Non Bessemer Wash Concentrate	47,619	58.97	.046	10.40	.14	.53
Bessemer Retreat Concentrate	<u>217,516</u>	<u>56.36</u>	<u>.031</u>	<u>12.70</u>		
	418,684	57.38	.033	11.89	.25	.40
<u>Brown No. 2</u>						
Bessemer Wash Concentrate	880,898	57.70	.027	11.43	.17	.45
Non Bessemer Wash Concentrate	397,892	56.56	.061	11.40	.16	.41
Bessemer Retreat Concentrate	520,940	56.68	.024	12.52		
Non Bessemer Retreat Concentrate	<u>175,931</u>	<u>56.43</u>	<u>.063</u>	<u>12.20</u>		
	1,975,661	57.09	.035	11.77	.17	.44
<u>North Star & Bingham</u>						
Non Bessemer Direct	53,259	57.98	.051	11.83		
Bessemer Wash Concentrate	632,733	58.40	.029	11.19	.16	.47
Non Bessemer Wash Concentrate	411,904	56.66	.049	11.08	.44	.41
Bessemer Retreat Concentrate	329,972	56.97	.032	11.86		
Non Bessemer Retreat Concentrate	<u>513,530</u>	<u>57.41</u>	<u>.047</u>	<u>11.96</u>		
	1,941,398	57.53	.039	11.50	.30	.44
<u>Holman & Brown</u>						
Bessemer Wash Concentrate	1,764,686	57.82	.028	11.20	.17	.43
Non Bessemer Wash Concentrate	718,168	56.75	.058	11.58	.16	.44
Bessemer Retreat Concentrate	758,970	56.59	.026	12.56		
Non Bessemer Retreat Concentrate	<u>175,931</u>	<u>56.43</u>	<u>.063</u>	<u>12.20</u>		
	3,417,755	57.26	.036	11.63	.17	.43
<u>Total Direct</u>						
Non Bessemer	53,259	57.98	.051	11.83		
<u>Total Wash Concentrate</u>						
Bessemer	2,397,419	57.97	.028	11.20	.17	.44
Non Bessemer	<u>1,130,072</u>	<u>56.71</u>	<u>.055</u>	<u>11.40</u>	<u>.25</u>	<u>.43</u>
	3,527,491	57.54	.037	11.27	.20	.44
<u>Total Retreat Concentrate</u>						
Bessemer	1,088,942	56.72	.030	12.33		
Non Bessemer	<u>689,461</u>	<u>57.16</u>	<u>.059</u>	<u>12.14</u>		
	1,778,403	56.89	.041	12.26		

<u>Total Product</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>
Bessemer	3,486,361	57.55	.028	11.58	.17	.44
Non Bessemer	<u>1,872,792</u>	<u>56.91</u>	<u>.056</u>	<u>11.68</u>	<u>.25</u>	<u>.43</u>
	5,359,153	57.33	.037	11.61	.20	.44

5. LABOR & WAGES

a. Comments

The labor supply was ample and of average efficiency. A strike called by the union on July 1 resulted in a one-day loss of production. A blanket increase of \$0.115 per hour with an increase of \$0.005 per hour in job class increments became effective on July 1.

b. Comparative Statement of Production & Wages

Wash & Retreat Concentrates-Tons	1,105,062
Number of Days Mine Operated	147
Average Number of Men Working	160
Average Wages Per Day	\$20.65
Production Per Man Per Day-Tons	47.20
Labor Cost Per Ton	\$0.440
Total Number of Man Days	23,546
Amount Paid for Labor	\$486,170.34

Comparative Statement of Production & Wages covers Pit and Lake Concentrator.

6. GENERAL SURFACE

a. Buildings & Repairs

Normal maintenance work was carried on throughout the year on mine buildings. \$2,536.74 was spent on maintenance and improvement of buildings: \$325.27 for work on six company-owned houses, and \$2,211.47 for new composition siding and exterior trim on two houses.

b. Roads, Transmission Lines, Etc.

Ore and stripping operations necessitated minor changes in pit transmission lines.

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c. Miscellaneous General Construction

The baffle and retaining dykes were raised as necessary at the tailings pond. The discharge line from the pit pump was moved to free an area for mining.

Under a contract awarded to the Western-Knapp Engineering Company in September, work was started in October on the construction of a cyclone plant. During the latter part of December, Holman mine crews started fabrication of chutes and hoppers which with piping and electrical installations will be their share of this construction. At the first of the year, the following progress had been made:

Excavations 90 per cent complete; piling 100 per cent; forms 50 per cent; concrete 65 per cent; all steel on order and delivery expected by January 25; all equipment and machinery on order and the following items delivered: Two Dings magnetic separators; two 66" Akins classifiers; two 16"x48" Wemco roll feeders; four Wemco sand pumps; and 122 used 10' conveyor pans from the Agnew mine.

The Western-Knapp Engineering Company will also construct a concentrate loading bin for separate fines loading facilities. Detailed plans are 75 per cent complete, and it is expected that both projects will be in operation early in 1956.

7. OPEN PIT

a. Stripping

Concurrent with ore operations in May, the unfinished stripping program under E&A No. MC-271 was completed with a 2-shift cleanup of surface and taconite from the Brown No. 2 lease. Following is a breakdown of stripping under this E&A:

5,660	yards stripped in May, 1955
<u>410,441</u>	yards stripped in 1954
416,101	yards stripped under E&A

At the end of the ore season on October 26, stripping was started under E&A No. MC-276 on a 3-shift, 5-day schedule with one shovel loading and serviced by an average of seven trucks. This program

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involved the movement of lean and waste material from the southeast corner of the Brown No. 2 lease and surface from the east side of the Bingham lease. This material was placed on dumps to the north.

The following table shows the material removed from the various leases during 1955:

<u>Lease</u>	<u>Surface</u>	<u>Lean & Waste Ore</u>	<u>Total</u>
Brown	13,835	111,242	125,077
North Star	<u>374,350</u>	<u>111,242</u>	<u>374,350</u>
	388,185	111,242	499,427

Cost of stripping under E&A No. MC-276 was \$0.348 per yard as compared to the budget estimate of \$0.395. An average of 3,964 cubic yards was produced per shift.

b. Open Pit Mining

Mining of crude ore from the pit started on April 25 on a 2-shift, 5-day schedule with two shovels serviced by from five to six trucks. On June 20, due to increased tonnage requirements, operations were increased to a 2-shift, 6-day schedule and continued until the end of ore season on October 26. Pit cleanup was accomplished, when necessary, on weekends.

1,922,223 tons of gross crude were moved during the season on 294 shifts at an average rate of 6,538 tons per shift. From this crude, 226,620 tons of screen rock were removed, leaving a total net crude of 1,695,603 tons and a shift average of 5,767 tons. This was the maximum tonnage of feed that the plant could handle and produce good metallurgical results on lowering of silica in concentrates.

201,810 tons of pit rock, lean and waste material were moved and placed on respective dumps at a ratio of .22 tons of waste per ton of ore and a cost of \$0.047 per ton of shipping ore.

The following table shows material mined from the various leases:

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<u>Lease</u>	<u>Gross Crude</u>	<u>Screen Rock</u>	<u>Net Crude</u>	<u>Pit Rock, Lean & Waste Material</u>
Holman	618,014	57,300	560,714	60,735
Brown	766,464	88,410	678,054	107,285
North Star	<u>537,745</u>	<u>80,910</u>	<u>456,835</u>	<u>33,790</u>
	1,922,223	226,620	1,695,603	201,810

Holman Lease: Mining from the Holman lease was from the pit bottom along the south side. Approximately 91 per cent of the ore mined was retreat and 9 per cent wash crude.

Brown Lease: Operations in the Brown No. 2 lease were about 99 per cent in retreat and 1 per cent in wash crude from the pit bottom and the various benches along the north and east sides. Ore from the pit bottom was high grade; however, ore layers immediately under the pit rock on the east side contained a silica content which was too high to absorb and this ore was, therefore, moved to a stockpile in the pit.

North Star Lease: The majority of the ore mined was from the NW-NE of Section 21, 56-24. Ore obtained from the NE-NE was from cleanup on this forty for a rock dump area. Approximately 78 per cent of the ore was retreat and 22 per cent wash crude.

Of the total ore mined from all leases during 1955, approximately 91 per cent was retreat and 9 per cent wash crude.

Two shovels in the pit were serviced by from five to six trucks. By thus mixing various ores, all grading requirements were met. Conditions were average throughout the season and no serious delays were encountered. Cost of producing crude ore in 1955 was \$0.213 per ton as compared to \$0.240 in 1954.

c. Pumping & Drainage

There were no major changes in pumping arrangements during the year and the flow of water remains constant at about 2,300 gallons per minute. Pumping cost per ton of concentrates was \$0.024 as compared with \$0.049 in 1954.

d. General Pit Activities

Minor power line and road changes due to ore operations resulted in a cost of \$0.014 per ton of concentrates, the same as in 1954.

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8. BENEFICIATION

a. Pit Plant

The pit plant operated on the same schedule as the pit and treated wash and retreat ores as required. Concentration started at 7 am on April 25 on a 2-shift, 5-day schedule which was increased on June 20 to a 2-shift, 6-day schedule and continued until the end of ore season on October 26. Repairs were conducted daily on the third shift.

1,695,603 tons of crude ore treated produced 923,209 tons of concentrates at a net weight recovery of 54.45 per cent and an average production rate of 3,140 tons per shift.

Of the wash ore portion of the feed, 155,940 tons of crude produced 107,514 tons of concentrates at a weight recovery of 68.95 per cent; the crude retreat feed of 1,539,663 tons produced 815,695 tons of concentrates at a weight recovery of 52.98 per cent. The total gross weight recovery was 48.03 per cent as compared with 45.20 per cent in 1954.

There were no flowsheet changes in the plant during the year.

Further tests were made early in the season on ores through the Remer jig unit and completed in June, resulting in a decision to construct a cyclone plant at this property.

A shortage of railroad cars necessitated stocking of concentrates for 523 hours. 211,262 tons of concentrates were stocked which with a 65,183-ton balance carried over from 1954 made a total of 276,445 tons. 176,838 tons of concentrates were shipped intermittently from April 21 through November 11, leaving a balance of 99,607 tons in stockpile as of December 31.

Although plant delays increased slightly over the 1954 season, plant operations were satisfactory and there were no serious delays. Following is a tabulation showing time lost due to delays:

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Washing Plant

<u>Source of Delay</u>	<u>Hours</u>	<u>Per Cent of Total Working Hours</u>
Out of Ore	2.82	0.12
8-Foot Pan Conveyor	4.50	0.20
Crude Ore Pocket	1.33	0.06
Pit Screen	9.42	0.40
Crude Ore Conveyor	0.58	0.02
Primary Screens	1.50	0.06
Secondary Screens	0.25	0.01
Railroad Cars & Tracks	1.00	0.04
Tailings Line	2.17	0.09
Miscellaneous Heavy-Media Plant	1.00	0.04
Electric Power	<u>10.93</u>	<u>0.48</u>
	35.50	1.52

Recapitulation

Ore to Head of Mill	18.66	0.80
Ore Processing Delays	<u>16.84</u>	<u>0.72</u>
	35.50	1.52

Heavy-Media Plant

Miscellaneous Washing Plant	30.00	1.41
Coarse Concentrate-Wash Screens	0.50	0.02
Coarse Reject-Truck	0.25	0.01
Electric Power	<u>1.50</u>	<u>0.07</u>
	32.25	1.52

Recapitulation

Ore to Head of Mill	30.50	1.44
Ore Processing Delays	<u>1.75</u>	<u>0.08</u>
	32.25	1.52

b. Lake Concentrator

The Lake Concentrator plant started operations on May 2 on a 2-shift, 5-day schedule which was increased on June 20 to a 2-shift, 6-day schedule and continued until the end of the ore season on October 26. The third shift each day was utilized for repairs. One shovel was engaged in loading, serviced by two trucks hauling crude ore and a third truck moving pit rock, screen rock, and rejects.

Material mined from the two stockpiles is shown as follows:

<u>Stockpile</u>	<u>Gross Crude</u>	<u>Screen Rock</u>	<u>Net Crude</u>	<u>Pit Rock</u>
Holman	478,462	87,720	390,742	42,372
Brown	<u>63,674</u>	<u>8,025</u>	<u>55,649</u>	<u>2,898</u>
	542,136	95,745	446,391	45,270

446,391 tons of crude ore were treated, producing 181,853 tons of concentrates at a net weight recovery of 40.74 per cent and an average production rate of 652 tons of concentrates per shift.

The plant operated satisfactorily throughout the season producing a slightly lower silica and a higher iron than anticipated. Some trouble was experienced due to excessive paint rock in the Brown pile.

The largest source of delay was railroad service on pulling loads and furnishing empty cars. This delay amounted to 43 per cent of the total delay time. The following table shows time lost from production due to delays:

<u>Source of Delay</u>	<u>Hours</u>	<u>Per Cent of Total Working Hours</u>
Out of Ore-Shovel Delays	76.75	3.39
Screen Plant	10.58	0.47
Crude Ore Conveyor	1.75	0.08
Primary Screens	0.33	0.01
Crusher	6.83	0.30
Circulating Media	2.50	0.11
Crockett Feed Pump	2.50	0.11

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<u>Source of Delay</u>	<u>Hours</u>	<u>Per Cent of Total Working Hours</u>
Magnetic Separators	0.75	0.03
Densifier	5.75	0.25
Hydroseparator	6.08	0.27
Spirals	7.58	0.33
Adjust Gravity	0.50	0.02
Concentrate Pocket	0.26	0.01
Railroad Cars	120.84	5.32
Chutes & Launderers	5.75	0.25
Plant Startup and Tieup	19.08	0.84
DC Generator	1.00	0.04
Electric Power	8.08	0.36
Clear Water Pump	<u>3.50</u>	<u>0.15</u>
	280.41	12.34

Recapitulation

Ore to Head of Mill	87.33	3.84
Ore Processing Delays	<u>193.08</u>	<u>8.50</u>
	280.41	12.34

The following table shows tonnages and analyses of various mill rejects and products:

<u>Wash Product</u>	<u>Tons</u>	<u>Per Cent Weight</u>		<u>Per Cent</u>			<u>Iron Units</u>
		<u>Plant</u>	<u>Pit</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	
Crude to Plant	129,873	100.00	87.54	45.97		29.36	
Pit Rock	2,080		1.40	24.93		59.32	
Screen Plant Rock	16,400		11.06	27.93		54.68	
Pit Crude	148,353		100.00	43.68		32.58	
Concentrates Produced	90,561	69.73	61.04	57.20	.034	11.75	86.77
Stockpile Overrun	53	0.04	0.04				
<u>Total</u>							
Concentrates Produced & Shipped	90,614	69.77	61.08	57.20	.034	11.75	86.82
Fine Tailings (by difference)	39,259	30.23	26.46	20.05		70.00	

Note: Iron Unit Recovery Calculated on Plant Basis

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<u>Retreat Product</u>	<u>Tons</u>	<u>Per Cent Weight</u>		<u>Per Cent</u>			<u>Iron Units</u>
		<u>Plant</u>	<u>Pit</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	
Crude to Plant	1,565,730	100.00	85.30	41.55		35.84	
Pit Rock	59,660		3.25	26.29		57.29	
Screen Plant Rock	210,220		11.45	26.18		58.04	
Pit Crude	1,835,610		100.00	39.29		39.08	
Concentrates Produced	832,567	53.17	45.36	57.49	.041	11.50	73.57
Stockpile Overrun	28	0.01					
<u>Totals</u>							
Concentrates Produced & Shipped	832,595	53.18	45.36	57.49	.041	11.50	73.57
Heavy-Media Concentrates	457,267	29.20	24.91	57.55		10.89	
Heavy-Media Rejects	162,693	10.39	8.86	40.56		36.16	
Heavy-Media Feed	619,960	39.60	33.77	53.07		17.42	
Fine Tailings (by difference)	570,442	36.43	31.08	18.57		71.28	
<u>Lake Concentrator</u>							
<u>Retreat Product</u>							
Crude to Plant	446,391	100.00	76.03	44.72		30.38	
Pit Rock	44,982		7.66	28.73		53.58	
Screen Plant Rock	95,745		16.31	32.97		47.87	
Pit Crude	587,118		100.00	41.58		35.01	
<u>Totals</u>							
Concentrates Produced & Shipped	181,853	40.74	30.97	55.08	.042	14.50	50.18
Heavy-Media Concentrates	129,631	29.04	22.08	54.20		15.48	
Heavy-Media Rejects	97,578	21.86	16.62	42.82		32.37	
Heavy-Media Feed	227,209	50.90	38.70	50.79		20.58	
Fine Tailings (by difference)	166,960	37.40	28.44	34.55		46.52	

Note: Iron Unit Recovery Calculated on Plant Basis

9. MAINTENANCE & REPAIRS

The usual maintenance program on mine and plant equipment was carried on from March 1 to the end of the year.

A minimum Winter & Idle repair program got under way on March 1 and continued until the start of ore season on April 25. Repairs in the plant and shops were then resumed and continued until the end of the year.

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10. COST of OPERATIONS

a. Comparative Cost of Operation

<u>Product</u>	<u>Year</u>		<u>Budget</u>
	<u>1954</u>	<u>1955</u>	<u>1955</u>
Crude Ore Tonnage	1,233,821	1,922,223	2,020,962
Concentrate Tonnage	558,045	923,209	867,212
Per Cent Recovery	45.24	44.84	43.00
Average Shift Output	3,033	3,759	3,000
Tons Per Man Per Day	40.53	47.20	40.00
Shifts Operated	184	294	290

Costs

Pit Operating	\$0.240	\$0.213	\$0.240
Concentrating	0.192	0.181	0.177
Misc. Pit & Beneficiation	0.135	0.089	0.074
General Mine Expense	0.184	0.115	0.107
Winter & Idle Expense	<u>0.770</u>	<u>0.300</u>	<u>0.300</u>
Cost of Production	\$2.086	\$1.327	\$1.459

Lake Concentrator

<u>Product</u>	<u>1953</u>	<u>1955</u>	<u>1955</u>
Crude Ore Tonnage	357,756	542,136	488,363
Concentrate Tonnage	121,246	181,853	182,638
Per Cent Recovery	33.89	33.54	37.40
Average Shift Output	655	652	600
Tons Per Man Per Day	30.27	34.10	30.00
Shifts Operated	191	279	300

Costs

Feeding	\$0.442	\$0.472	\$0.440
Concentrating	0.685	0.640	0.633
General Mine Expense	0.187	0.196	0.183
Winter & Idle Expense	<u>0.306</u>	<u>0.300</u>	<u>0.300</u>
Cost Of Production	\$1.620	\$1.608	\$1.556

Note: Costs are not final Cleveland costs.
Lake Concentrator had no operation in 1954.

10. COST of OPERATIONS

b. Comments

Cost of production for 1955 was \$0.759 lower than for 1954 and was \$0.132 lower than the budget. No reasonable cost comparison can be made because of the reduced 1954 production schedule. Major differences occur in items where overhead charges are high.

In comparison with the 1955 budget, we find the following:

Pit Operating: The decrease of \$0.027 was evenly distributed throughout the various items and was due entirely to a good rate of production being maintained throughout the season.

Concentrating: The increase of \$0.004 was only nominal and evenly distributed.

Miscellaneous Pit & Beneficiation: An increase of \$0.015 was concentrated under "Vacation Pay"; this item will be corrected on final cost sheet for the year as it evidently was an error in the budget.

General Mine Expense: These items were \$0.007 higher than the budget. No detailed comparison can be made as no detailed budget figures are available.

Lake Concentrator

Cost of production for the Lake Concentrator was \$0.052 higher than the budget and \$0.012 lower than 1953 costs. No figures are available for 1954 as this plant did not operate. No detailed comparison can be made with 1953 due to cost changes in labor and supplies during the two years.

In comparison with the budget for 1955, we find the following:

Feeding: An increase of \$0.032 was due entirely to repairs to the old 120-B shovel.

Concentrating: The increase of \$0.007 was a nominal amount and was distributed evenly throughout the various items.

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General Mine Expense: This item was \$0.013 higher than the budget. No detailed comparison can be made as no budget figures are available.

11. EXPLORATION & FUTURE EXPLORATION

From early July until the end of October, the Henry Schultze Drilling Company drilled three holes for a total of 802 feet on the east side of the Bingham lease. No additional ore was proven up; however, the ore body was definitely outlined.

It will be necessary in the future to continue drilling in this area and also on the east side of the Brown No. 1 lease to definitely establish the ore body and to obtain information on the grade of ore.

12. TAXES

	1955		1954		Increase-Decrease	
	Assessed Value	Taxes	Assessed Value	Taxes	Assessed Value	Taxes
Mineral	\$ 965,893	\$161,825.71	\$ 996,820	\$154,427.35	-\$30,927	\$7,398.36
Land,Bldg,Mach.	122,672	30,921.18	122,672	19,427.76		1,493.42
<u>Personal Property</u>						
Equipment	86,524	14,608.57	76,557	11,860.21	9,967	2,748.36
Stockpile	15,754	2,639.43	40,414	6,260.94	- 24,660	- 3,621.51
Lake Conct.S.P.Only	62,488	11,353.22	62,488	10,695.49		657.73
	<u>\$1,253,331</u>	<u>\$211,348.11</u>	<u>\$1,298,951</u>	<u>\$202,671.75</u>	<u>-\$45,620</u>	<u>\$8,676.36</u>
Average Mill Rate		168.63✓		156.03✓		+ 8.08%

Mineral valuation reduced by 1954 production plus small tonnage increased by reserve adjustment on one forty. Personal property equipment increased 10 per cent over our report by State Commissioner of Taxation. Concentrate stockpile tonnage on hand May 1, 1955, less than on hand 1954. Lake Concentrator not operating in 1954 so no change in reserve value.

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Tax Commission Reserve

	Tons		<u>Decrease</u>
	<u>1955</u>	<u>1954</u>	
May 1	6,255,944	6,677,567	421,623
Lake Concentrator	400,566	400,566	

13. ACCIDENTS & PERSONAL INJURY

<u>Name</u>	<u>Date of Injury</u>	<u>Nature</u>	<u>Cause</u>	<u>Time Lost</u>	<u>Compensation</u>
Kenneth Nelson	4-26-55	Broken Ankle	Fell from shovel running board.	61 Days	\$497
Melvin Olson	6-6-55	Broken Bone in Foot	Drill stem dropped on foot.	69 Days	\$515
Herman Bignell	8-5-55	Broken Bone in Leg	Drill stem hit leg when moving drill.	55 Days	\$375
Loren Thoreson	10-25-55	Laceration Left Hand	Caught hand in conveyor pulley.	27 Days	\$221

14. NEW CONSTRUCTION

- a. Completed during 1955 None
- b. To Be Completed during 1956
 - 1. Cyclone Plant
 - 2. Facilities for Separate Loading Coarse-Fine Concentrates.

15. EQUIPMENT RECEIVED & PROPOSED NEW EQUIPMENT

- a. Received during 1955
 - 1 Bucyrus Erie Electric Shovel 6-yard
 - 2 International Pickup Trucks 3/4-ton
 - 1 International Service Truck 1-1/2 ton
 - 5 Oil Conversion Units for Automatic Oil Heat
 - 1 450 hp Motor; Spare Pump Parts for Pit Drainage Pump

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b. Proposed Equipment for 1956

- 1 Austin-Western Grader
- 1 Caterpillar D-7 Tractor
- 1 Ford Tractor & Trailer

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1. GENERAL

The only activity connected with the Sally mine consisted of a survey by the Great Northern Railway Company to reroute their access railroad to the Danube mine, necessitated by Cliffs' intention to strip the Sally in the fall of 1956.

No change has been made in the reserve estimate. See the 1953 annual report for details.

TAXES

	<u>1955</u>		<u>1954</u>		<u>Increase-Decrease</u>	
	<u>Assessed Value</u>	<u>Taxes</u>	<u>Assessed Value</u>	<u>Taxes</u>	<u>Assessed Value</u>	<u>Taxes</u>
Mineral	\$231,247	\$37,320.95	\$231,247	\$35,438.60		\$1,882.35
Land	666	115.79	666	109.43		6.36
	<u>\$231,913</u>	<u>\$37,436.74</u>	<u>\$231,913</u>	<u>\$35,548.03</u>		<u>\$1,888.71</u>
Average Mill Rate		161.43		153.28		+ .53%

Tax Commission Reserve

May 1

Tons

<u>1955</u>	<u>1954</u>
1,751,579	1,751,579

SARGENT OPEN PIT MINEANNUAL REPORTYEAR 19551. GENERAL

During the first quarter of 1955, the Sargent mine was shut down completely. On April 18, a few men were recalled to prepare the pit and plants for operation. On April 25, ore production was started with the pit working on a 1-shift and the washing plant on a 2-shift, 5-day schedule. A small lean ore pile which was sorted and salvaged from stripping operations was reloaded and processed and gave a good product. All of the crude and direct ores were screened to scalp out the oversized rock and all marginal ores were washed to obtain lower silica ratios.

The 3-1/4 yard Bucyrus Erie shovel was used in mining with six 22-ton Euclid trucks--three trucks operating on the pit ore haul, two hauling from the screening plant to the wash plant stockpile, and one operating on rock rejects. Five trucks were used in pit cleanup operations.

Most of the crude ore for the season was obtained from the milling pit proper and from pillars in caves in the south channel and south wall. A large amount of taconite, cave, and surface material was removed to obtain this ore and charged to mining. For the season, 63,532 cubic yards of this material were removed.

On June 20, ore operations were stepped up to a 6-day schedule. At this time, scrap iron was cleaned up and shipped from the old underground shaft and vicinity. 3317 tons of Mesabi Chief line ore were mined and shipped by Hanna during this period. Some rain storms in May and early June sloughed the banks considerably and during cleanup operations much of the waste and cave material was hauled to the tailings pond to strengthen the dykes.

During July the Sargent mine was shut down and men transferred to the Hawkins mine to fill out a third shift, a few men being retained for repair of trucks and tractors. Heavy rains in July entailed more cleanup work than the spring thaw. On July 12, the screening and loading facilities were rented to the Pacific Isle Mining Company in order to ship its Mississippi ore to the Carson Lake plant; by intermittent and off-shift loading, the Pacific Isle Mining Company shipped out approximately 114,874 tons of crude by October 11.

With the approval of E&A No. CC-709, exploration drilling was started on August 1 on the south side of the milling pit just east of the Hanna line. The mine and plant remained inoperative

throughout the month with all idle expense being charged to operating cost. Three old buildings of the underground plant were sold to be razed and moved off the property in order to reduce personal property taxes.

On September 19, production was again resumed at the Sargent mine upon return of crews released with the close of operations at the Hawkins tailings basin. The plant started on a 1-shift, 6-day schedule but returned to a 2-shift, 6-day schedule on September 29, with Pacific Isle using the screening and loading facilities on the afternoon shift. During this period, the old steel headframe was dismantled and old underground rails were cleaned up and shipped as scrap.

In the final development of the lower ore in the south channel, painty materials were encountered which necessitated the use of additional water in plant operations for desliming and reducing the resultant moisture and silica contents.

Ore operations were brought to a close on October 15 but cleanup in the pit continued until October 20 when the shovel was moved out to start developing a new pit approach. All this work was conducted on a 1-shift, 5-day schedule until October 31 when a 3-shift-per-day schedule became effective.

With the approval of the stripping program under E&A No. CC-746, east extensions to the old milling pit were started on November 1 with the removal of surface and underground caves from the south channel area. Operating conditions were favorable throughout November but with the advent of extreme subzero temperatures in December, heavy frost conditions developed entailing some unseasonal drilling and blasting expenses. The 3-1/4 yard Bucyrus Erie shovel was used with five 22-ton Euclid trucks on the haul until completion of the program on December 30.

An exploration drilling program was started on August 1 and completed on December 8 which justified the easterly pit extensions of the south channel and revealed some possibilities of a small orebody in the northeast corner of the property.

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2. PRODUCTION-SHIPMENTS-INVENTORIES

a. Production by Grades

<u>Product</u>	<u>Tons</u>
Crude Ore	67,395
Concentrates	62,025
Direct Ore	12,067

b. Shipments

Concentrates	62,025
Direct Ore	<u>12,067</u>
	74,092

c. Inventories

None

d. Production by Months

<u>Month</u>	<u>Crude</u>	<u>Concentrates</u>		
	<u>Open Pit</u>	<u>Open Pit</u>	<u>Direct</u>	<u>Total</u>
April	5,553	4,303		4,303
May	22,870	19,989		19,989
June	23,637	22,115	3,317*	25,432
July				
August				
September	6,178	6,244	2,577	8,821
October	8,391	9,374	6,173	15,547
November	766			
	<u>67,395</u>	<u>62,025</u>	<u>12,067</u>	<u>74,092</u>

*Hanna Line Ore

3. ANALYSIS

a. Tonnage & Analysis of Crude Ore

<u>Tons</u>	<u>Iron</u>	<u>Silica</u>
67,395	52.77	17.61

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b. Tonnage & Complete Analysis Produced & Shipped

<u>Sargent</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>	<u>Lime</u>	<u>Mag</u>	<u>Sulf</u>	<u>Ign Loss</u>	<u>Moist</u>
Open Pit Concentrates	62,025	56.06	.056	12.78	.87	1.35	.32	.20	.010	2.56	12.35
Open Pit Direct	8,750	54.34	.057	12.78	1.22	2.09	.31	.21	.011	5.02	14.40
Trespass Direct	<u>3,317</u>	<u>52.66</u>	<u>.068</u>	<u>14.11</u>	<u>1.62</u>	<u>1.66</u>	<u>.31</u>	<u>.21</u>	<u>.011</u>	<u>5.92</u>	<u>13.73</u>
	74,092	55.71	.057	12.84	.94	1.45	.32	.20	.010	2.87	12.65

4. ESTIMATE of ORE RESERVES

a.	<u>Product</u>	<u>Cubic Feet Per Ton</u>	<u>Rock Reduction</u>	<u>Per Cent Recovery</u>
	Merch Ore	14	0	100
	Wash Concentrates	14	0	60

b. Ore Reserves as of December 31, 1955

<u>Lease</u>	<u>Reserve 12-31-54</u>	<u>Mined 1955</u>	<u>Balance After Mining</u>	<u>Changed by Re-Estimate</u>	<u>Reserve 12-31-55</u>
NE-SE 23, 57-22				71,000	71,000
SW-SE 23, 57-22	60,000	61,570		51,570	50,000
NW-SE 23, 57-22		3,317		3,317	
NW-NE 26, 57-22		<u>9,205</u>		34,205	<u>25,000</u>
	<u>60,000</u>	<u>74,092</u>		160,092	<u>146,000</u>

c. Estimated Analysis of Reserves

<u>Open Pit NE-SE 23, 57-22</u>	<u>Non Bessemer Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>	<u>Moist</u>	<u>Iron Natural</u>
Merch	43,000	54.34	.057	12.78	1.22	2.09	14.00	46.73
Wash Concts.	<u>28,000</u>	<u>56.06</u>	<u>.056</u>	<u>12.78</u>	<u>.87</u>	<u>1.35</u>	<u>12.00</u>	<u>49.33</u>
	71,000	55.02	.057	12.78	1.08	1.80	13.21	47.81

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<u>Open Pit</u> <u>SW-SE 23, 57-22</u>	<u>Non Bessemer</u> <u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>	<u>Moist</u>	<u>Iron</u> <u>Natural</u>
Merch	10,000	54.34	.057	12.78	1.22	2.09	14.00	46.73
Wash Concts	<u>40,000</u>	<u>56.06</u>	<u>.056</u>	<u>12.78</u>	<u>.87</u>	<u>1.35</u>	<u>12.00</u>	<u>49.33</u>
	50,000	55.72	.056	12.78	.94	1.50	12.40	48.81
<u>NW-NE 26, 57-22</u>								
Wash Concts	25,000	56.06	.056	12.78	.87	1.35	12.00	49.33
<u>Total Sargent</u>								
Merch	53,000	54.34	.057	12.78	1.22	2.09	14.00	46.73
Wash Concts	<u>93,000</u>	<u>56.06</u>	<u>.056</u>	<u>12.78</u>	<u>.87</u>	<u>1.35</u>	<u>12.00</u>	<u>49.33</u>
	146,000	55.44	.056	12.78	1.00	1.62	12.73	48.38

Note: Based on estimated 1956 and 1957 production to deplete mine.

d. Prospective Reserves

<u>Material</u>	<u>Tons</u>	<u>Iron</u>	<u>Moisture</u>	<u>Iron</u> <u>Natural</u>
Merch	40,000	55.00	15.00	46.75
Wash Concentrates	430,000	56.00	13.00	48.72
Retreat Concentrates	<u>390,000</u>	<u>56.00</u>	<u>13.00</u>	<u>48.72</u>
	860,000	55.95	13.09	48.63

The above reserve is all underground and is not considered to be economically mineable.

5. LABOR & WAGES

a. Comments

The labor supply was plentiful and labor relations were good.

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b. Comparative Statement of Wages & Product

Tons	70,775
Number of Days Operated	149
Number of Shifts Operated	151
Average Daily Product	475.0
Average Product Per Shift	468.7
Average Production Per Man Per Day	28.9
Average Wages Per Hour-Ore Season	\$2.553
Amount Paid for Labor-Ore Season	\$50,089.40
Labor Cost Per Ton	\$0.708

6. GENERAL SURFACE

a. Building & Repair

No work was done in 1955 and none is contemplated in the immediate future. Three of the old buildings of the underground mine were sold during the year to reduce future taxes.

b. Roads, Transmission Lines, Etc.

No new power lines were constructed in 1955 and none are contemplated for 1956 unless water cannot be obtained through the facilities of the Pacific Isle Mining Company at the St. Paul mine.

If any work is to be done in the east side of the pit where drilling exposed a possible pit site, a new road will be needed.

A 1500-foot ditch is proposed for drainage of water from the new pit site to the old north pit.

In an effort to reduce a long haul during November and December stripping operations, a short road was made to the stripping dump.

c. Miscellaneous General Construction

There was no miscellaneous general construction during the year and only if it becomes necessary a raft will be built to accommodate a pump installation for a water supply from the St. Paul mine.

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7. OPEN PIT

a. Stripping

Under E&A No. CC-746, stripping was carried on in November and December on a 3-shift, 5-day schedule using five 22-ton Euclid trucks and one Bucyrus Erie 3-1/4 yard shovel. Operating conditions were good in November, but were hampered by cold weather in December. The purpose of this stripping program was to expose caved ore and to make ore available on the south wall of the south channel of the old milling pit.

A summary of this stripping follows:

<u>E&A No.</u>	<u>Cubic Yards Stripped 1955</u>	<u>Estimated Cost</u>	<u>Actual Cost</u>	<u>Over Under</u>
746	215,795	\$0.380	\$0.373	-\$0.007

b. Open Pit Mining

For the season, 74,112 tons of ore were shipped including 62,025 tons of concentrates and 12,067 tons of merch ore. Merch ore shipments included 3,317 tons of line ore mined by the M. A. Hanna Company. To obtain this ore, 98,589 tons of waste, rock, etc., were removed and charged to operating. Average production per shift in 1955 was 813.5 as compared to 1056.3 in 1954. Including the 98,589 tons of waste and rock removed, the average for 1955 was 1946.7 as compared to 1967.0 in 1954. All material removed was over an approach road of 11.3 per cent grade.

Ore shipped during the year came from pillars left by the underground, from old caves, and from borderline areas along the rock walls.

In 1955, for each 0.7 tons of ore shipped, one ton of waste and rock was removed; in 1954, for each 1.5 tons of ore shipped, one ton of waste and rock was removed.

c. Drainage & Pumping

No pumping was necessary during the year for the drainage of the pit as all water was run off into the underground drifts. However, with the purchase of the St. Paul mine by the Pacific Isle Mining Company and the subsequent pulling of pumps in October, eventual drainage might be reversed and become a responsibility of the Sargent mine.

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Since the pumps were removed, the water rose from a 1290-foot elevation to 1303 feet by the end of the year. It is rising very slowly now but if the 1312-foot mark is reached, drainage will flow back through the drifts.

8. BENEFICIATION

a. Plant Operation

Screening plant operations were satisfactory and a minimum of delays were experienced. Because of wood and boards in a great deal of the ore, none of the oversize was crushed, resulting in a further reduction in silica.

An additional nozzle was placed over the top of the vibrating screen to help with the painty ore that was encountered in the lower horizons of the orebody along the old main level drifts.

Gross recovery for the year was 86.12 per cent and net recovery was 92.03 per cent as compared to 91.5 per cent in 1954. The washing plant operated 137 shifts (1096 hours) with a loss of 126 hours (11.5 per cent) as compared to 5.3 per cent in 1954. In 1955, the plant was on a 2-shift schedule whereas in 1954 a 1-shift schedule was maintained.

9. MAINTENANCE & REPAIRS

None

10. COST of OPERATIONS

a. Comparative Cost Statement

<u>Product</u>	<u>1955 Budget Revised 8-25-55</u>	<u>Cost Per Ton</u>	
		<u>1955</u>	<u>1954</u>
Direct Ore	5,000	8,750	41,340
Concentrates	65,500	62,025	33,658
Average Daily Output		813.5	1056.3
Tons Per Man Per Day		28.9	42.9
Days Operated		149	72

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<u>Costs</u>	1955 Budget	<u>Cost Per Ton</u>	
	<u>Revised 8-25-55</u>	<u>1955</u>	<u>1954</u>
<u>Total</u>			
Pit Operating	\$0.365	\$0.375	\$0.583
Beneficiation	0.198	0.193	0.123
Miscellaneous Pit & Beneficiation	0.165	0.149	
Pit & Beneficiation	<u>\$1.246</u>	<u>\$1.281</u>	<u>\$0.939</u>
General Mine	0.307	0.272	0.177
Winter & Idle	0.417	0.346	0.579
Total Cost of Production	<u>\$1.970</u>	<u>\$1.899</u>	<u>\$1.695</u>
<u>Depreciation</u>			
Plant & Equipment		0.045	0.296
Motorized Equipment & Other		0.079	0.089
Movable Equipment			0.009
<u>Taxes</u>			
Ad Valorem		0.340	0.310
Occupational		0.026	0.057
Royalty		0.084	0.081
Total Depreciation & Taxes		<u>\$0.574</u>	<u>\$0.842</u>
Administrative Expense		0.050	0.131
Miscellaneous Expense & Income-Net		0.009	0.020
Royalty		0.699	
Total Cost on Cars		<u>\$3.231</u>	<u>\$2.688</u>

11. EXPLORATION & FUTURE EXPLORATION

E&A No. CC-709 was approved in July and drilling by the Henry M. Schultze Company was started on August 1. From cross sections, old underground maps, and old drilling, it was believed that a considerable tonnage of wash and retreat ore would be developed.

Up to the first of the year, eight holes were drilled for a total of 1195.5 feet. Five of the holes were put down in the area south and east of the present milling pit and three in the area close to the St. Paul mine and east of the present screening and loading plant. The holes in the milling pit area did not contribute much to the present reserves, but the holes to the east proved up a small pit of upper ore which the Engineering Department is now estimating for possible future development.

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Hole No.	Coordinates	Elevation	Depth of Surface	Total Depth
S-51	250 S - 200 E	1513.7	73	184.5
S-52	130 N - 1100 E	1518.0	98	140.0
S-53	250 N - 1200 E	1512.0	94	191.0
S-54	280 N - 1300 E	1516.0	80	200.0
S-55	412 N - 800 E	1518.8	71	203.0
S-56	2000 N - 2200 E	1534.4	55	115.0
S-57	1900 N - 2400 E	1525.0	58	85.0
S-58	2100 N - 2000 E	1524.3	41	77.0
				<u>1195.5</u>

A balance of \$10,000 remaining in the present E&A should take care of any additional drilling that may be required in 1956.

12. TAXES

a. Underground & Open Pit

	1955		1954		Increase-Decrease	
	Assessed Value	Taxes	Assessed Value	Taxes	Assessed Value	Taxes
Mineral	\$55,258	\$16,947.16	\$ 77,157	\$21,217.79	-\$21,899	-\$4,270.63
Lands, Bldgs, Mach.	18,067	5,498.61	19,444	5,258.10	- 1,377	240.51
<u>Personal Property</u>						
Equipment	6,294	1,956.93	5,852	1,633.99	442	322.94
	<u>\$79,619</u>	<u>\$24,402.70</u>	<u>\$102,453</u>	<u>\$28,109.88</u>	<u>-\$22,834</u>	<u>-\$3,707.18</u>
Average Mill Rate		306.49		274.13	/	11.80%

Mineral reserve valuation decreased by 1954 production; lands, buildings, and machinery value decreased by removal of four houses from property; personal property increased by 10 per cent over our return by order of State Commissioner of Taxation.

Tax Commission Reserve as of May 1

Tons		Decrease
1955	1954	
3,719,399	3,798,700	-79,301

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13. ACCIDENT & PERSONAL INJURY

1. William Casey

On September 19, injured palm of right hand while shifting gears on truck. Lost 31 days. Compensation paid: \$260.53

2. Fred J. Jaksch

At 11:45 p.m. on December 29, 1955, Jaksch was backing the truck to the dump. Because a heavy fog and smoke obscured the driver's vision, he failed to see the dump crest and the dumpman, and as the truck backed over the dump, he jumped. In doing so, he was caught by the door and possibly struck by a large chunk as he landed on the slope of the dump. Statement by dumpman: "The driver told me that he could not see me, after which I yelled to him to stop. The truck did not stop but kept on backing over the dump." The truck driver sustained a fractured pelvis and did not recover from the accident. He died on January 6, 1956.

Mr. Jaksch should have stopped his truck when the view of the dumpman was obstructed. If he had stayed with the truck, his injuries might have been very minor as the truck did not turn over, going down only about 62 feet.

14. PROPOSED NEW CONSTRUCTION

None

15. EQUIPMENT RECEIVED & PROPOSED NEW EQUIPMENT

No new equipment is proposed, but with the Wanless mine starting operations in 1956, the D-8 and the HD-19 tractors will have to be returned. As a replacement, an HD-19 Allis-Chalmers tractor was acquired from the Holman mine. The Caterpillar Model No. 12 grader and the sprinkler wagon will also have to be returned to the Wanless and these will be replaced by used equipment from the larger mines.

WANLESS MINE
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1. GENERAL

The Wanless mine was still shut down at the close of 1954 and remained so for the year 1955. The only activity at the mine was continued pumping from the pit by the Snyder Mining Company to hold the water down in its adjoining Whiteside mine.

Negotiations were begun in 1955 with the Colorado Fuel & Iron Company to take two-thirds of the yearly production of the Wanless mine, with Cliffs to remain as operators and retain the other one-third interest.

TAXES

	<u>1955</u>		<u>1954</u>		<u>Increase-Decrease</u>	
	<u>Assessed Value</u>	<u>Taxes</u>	<u>Assessed Value</u>	<u>Taxes</u>	<u>Assessed Value</u>	<u>Taxes</u>
Mineral	\$157,014	\$13,658.65	\$157,014	\$12,763.67		\$894.98
Lands, Bldgs, Mach.	1,982	174.67	1,982	163.69		10.98
<u>Personal Property</u>						
Equipment	1,059	92.12	1,115	90.64	-\$56	1.48
Stockpile	2,357	205.04	2,357	191.60		13.44
	<u>\$162,412</u>	<u>\$14,130.48</u>	<u>\$162,468</u>	<u>\$13,209.60</u>	<u>-\$56</u>	<u>\$920.88</u>
Average Mill Rate		87.00		81.31		+ 7.00%

Note: No change in values except small amount of personal property transferred. Increase in mill rate.

Tax Commission Reserve

May 1, 1955	1,419,971
May 1, 1954	1,419,971

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11. ACCIDENTS
AND
PERSONAL
INJURY

a. Fatal Accidents

During 1955 we were unfortunate enough to have four employees fatally injured. Three were caused by explosives and one was a truck accident.

The explosives accidents were the first since July 26, 1943 when one man lost his life after overstaying his time at the face and using too many hot wire lighters.

With an average of 3,742 employees and four fatal accidents, we have a fatality rate of 1.07, based on per thousand employees which is the American Standards method of compiling the statistics.

As a comparison, during the period 1898, when records were first kept, until 1911, the first year of organized safety, the fatality rate was 4.99. From 1911 through 1955 the average fatality rate is 1.80 and this includes the Barnes Hecker disaster in 1926, at which time 51 men lost their lives in the one accident and 4 others were fatally injured from other causes.

For the five-year period 1951 - 1955, inclusive, the fatality rate is .58.

Table I is interesting as it shows the drop in fatalities over the years and indicates progress in the safety program.

A brief summary of fatal accidents for the year follows:

MATHER MINE, "B" SHAFT - Wilfred E. Mallett, 8/29/55

Mallett and his partner were lighting fuses in their contract when one or two holes went off. The explosion caused multiple wounds and severed an artery in Mallett's groin, causing death mainly through loss of blood. The partner had only slight injuries.

The investigation committee classified the accident as III-A-4 and III-B-4 (Wrong method of doing work on part of both men).

Investigation disclosed two long fuses which had been cut and not burned and indicated that either one or both men were guilty of "short-fusing".

MATHER MINE, "A" SHAFT - Henry Anderson, 10/10/55
Rupert Frederickson, 10/10/55

In this case, the men were charging long holes in a top timber drift. The holes angled at about 45° to 50°. Primacord was the detonator. In the next slice (16 feet away) a scraper operator had placed a bomb in a hung mill which angled toward the holes being charged. He claims he warned the miners and then went back to shoot the bomb. The miners did not leave their place and apparently the bomb propagated the miners' charged hole, followed down the primacord, exploding the roll of primacord and two boxes of powder. If the miners were warned, it is hard to understand why they did not seek safety as they knew conditions or they should have asked the scraper operator to wait until they were ready to blast.

(Continued)

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11. ACCIDENTS
AND
PERSONAL
INJURYa. Fatal Accidents (Continued)

SARGENT MINE - Fred J. Jaksch, 12/29/55

Jaksch, a heavy duty truck operator, was hauling stripping waste to the dump. He backed his truck towards the edge of the dump but claimed he could not see or hear the dumpman. Temperature was 17° below zero, causing steam to rise from the waste rock with heavy fogging from the engine exhaust. His truck backed over the dump and Jaksch jumped as soon as possible, but the truck door struck him and he was thrown against some large pieces of rock. A fractured pelvis and internal injuries caused death a week later.

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11. ACCIDENTS
AND
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INJURYa. Fatal Accidents (Continued)

TABLE I

FATAL ACCIDENT RECORD
THE CLEVELAND-CLIFFS IRON CO. AND CLIFFS POWER & LIGHT CO.
1898-1955, INCLUSIVE

<u>YEAR</u>	<u>NO. MEN EMPLOYED</u>	<u>NO. OF FATALITIES</u>	<u>FATALITY RATE</u>
1898	1065	6	5.63
1899	1174	4	3.41
1900	1427	4	2.80
	3,666	14	3.79
1901	1317	9	6.83
1902	1485	8	5.38
1903	1551	8	5.15
1904	1338	4	2.97
1905	2038	12	6.54
	7,729	41	5.30
1906	2418	10	4.13
1907	2843	17	6.00
1908	2340	6	2.52
1909	2520	13	5.15
1910	2907	20	6.88
	13,028	66	5.06
1898 - 1910		121	4.99
1911	2633	5	1.90
1912	2335	4	1.71
1913	2521	11	4.19
1914	2435	10	4.10
1915	3308	5	1.51
	13,332	35	2.70
1916	3063	8	2.61
1917	3457	6	1.73
1918	3765	13	3.45
1919	3938	11	2.79
1920	4125	5	1.21
	18,348	43	2.36
1921	2309	6	2.60
1922	2301	1	.43
1923	2728	6	2.20
1924	2472	5	2.02
1925	2472	2	.81
	12,282	20	1.61

(Continued)

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11. ACCIDENTS
AND
PERSONAL
INJURYa. Fatal Accidents (Continued)

TABLE I (Cont'd.)

<u>YEAR</u>	<u>NO. MEN EMPLOYED</u>	<u>NO. OF FATALITIES</u>	<u>FATALITY RATE</u>
1926	2119	55	25.96
1927	1969	4	2.03
1928	1784	4	2.25
1929	2000	4	2.00
1930	2566	5	1.95
	10,438	72	6.90
1931	1651	3	1.82
1932	630	0	0.00
1933	631	2	3.17
1934	1073	4	3.74
1935	1313	2	1.53
	5,298	11	2.05
1936	2125	2	.94
1937	2763	1	.36
1938	2590	3	1.17
1939	2457	1	.41
1940	2756	5	1.88
	12,691	12	.94
1941	3570	5	1.40
1942	3562	2	.56
1943	3609	4	1.11
1944	3584	3	.84
1945	3078	1	.32
	17,403	15	.86
1946	2791	0	0.00
1947	3942	7	1.78
1948	4003	3	.75
1949	4191	1	.24
1950	4344	5	1.15
	19,271	16	.83
1951	4975	2	.40
1952	4906	5	1.02
1953	4952	2	.40
1954	3946	0	0.00
1955	3742	4	1.07
	22,521	13	.58
1911 - 1955	131,584	237	1.80

BASED ON PER THOUSAND
EMPLOYEES

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11. ACCIDENTS AND PERSONAL INJURY

a. Fatal Accidents (Continued)

TABLE II

CLASSIFICATION OF CAUSES OF FATAL ACCIDENTS FROM DECEMBER 1, 1898 TO DECEMBER 31, 1955

A.	Fall Of Ground	115	
	Run Of Mud Or Sand	60	
	Fall Of Chunk Of Ore From Chute	3	
	Stray Chunk Or Stick Down Raise Or Stope	<u>4</u>	182
B.	<u>Shaft Accidents:</u>		
	Falling Down Shaft	16	
	Rock Or Timber Falling Down Shaft	3	
	Struck Or Caught By Cage, Skip, Bucket, Tool	8	
	Falling From Cage, Skip Or Bucket	11	
	Falling From Ladder In Shaft	5	
	Carried Or Pushed Into Shaft By Car	3	
	Jumping On Or Off Cage, Skip Or Bucket	3	
	Struck By Crosshead	5	
	Struck By Falling Material	<u>2</u>	56
C.	<u>Use Of Explosives:</u>		
	Explosion Of Powder	19	
	Premature Blast	3	
	Fall Of Ground Or Timber Due To A Blast	4	
	Overcome By Gas	3	
	Miscellaneous Causes	<u>2</u>	31
D.	<u>Mine, Railroad Cars, Trucks, Etc.:</u>		
	Caught By Haulage Cars	16	
	Riding Or Attempting To Ride Cars	6	
	Falling With Car From Trestle	4	
	Run Over By Railroad Car	8	
	Struck By Locomotive	3	
	Truck Haulage	1	
	Miscellaneous Causes	<u>1</u>	39
E.	<u>Miscellaneous Causes:</u>		
	Falling In Raise, Stope Or Pocket	10	
	Electric Shock	12	
	Falling From Ladder, Trestle, Etc.	8	
	By Moving Machinery	8	
	Mine Fires	3	
	Stockpile Slide	3	
	Slipping And Falling	1	
	Miscellaneous Causes	<u>5</u>	50
	TOTALS		<u>358</u>

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11. ACCIDENTS
AND
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INJURY

a. Fatal Accidents (Continued)

TABLE III

CLASSIFICATION OF FATAL ACCIDENTS - 1911 TO 1955, INCLUSIVE
BY THE CENTRAL SAFETY COMMITTEE

I.	<u>Trade Risk</u>		127
II.	<u>Negligence Of Company</u>		
	Violation Of Rules	6	
	Failure To Provide Safety Devices	7	
	Improper Method Of Doing Work	12	
	Failure To Provide Tools Or Safe Places To Work ...	5	
	Failure To Instruct Men	5	
	Improper Act Or Selection Of Improper Method Of Doing Work (By Foreman)	<u>1</u>	36
III.	<u>Negligence Of Workmen</u>		
	A. <u>Injured Men:</u>		
	Improper Act Or Improper Method Of Work	29	
	Violation Of Rules	10	
	Failure To Use Tools Or Appliances Provided	4	
	Failure To Use Safety Devices	<u>4</u>	47
	B. <u>Other Men:</u>		
	Improper Act Or Improper Method Of Work	14	
	Violation Of Rules	4	
	Failure To Use Tools Or Appliances Provided	<u>1</u>	19
	A.B. <u>Injured Men & Other Men:</u>		
	Improper Act Or Improper Method Of Work	<u>4</u>	4
II.-5,	IIIA3, Failure To Instruct Men By Foreman And Violation		
IIIB3	Of Rules By Injured Man And Partner	<u>1</u>	1
II.-5,	IIIA4, Failure To Instruct Men As To Method Of Work And		
IIIB4	Improper Method Of Doing Work By Injured Workman And Other Workman	<u>2</u>	2
II.-2,	IIIA2, Failure To Use Proper Tools Or Appliances		
IIIB2	Provided (By The Foreman, Injured Workman And Other Workman	<u>1</u>	1
	TOTALS		<u>237</u>

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INJURYb. All Injuries (Continued)Causes Of Compensable Injuries - Underground

Persons slipping and falling caused the greatest number of injuries with thirteen. Although this frequency is high, the severity is fairly low but this has been the cause of considerable lost time. To prevent this type of accident requires good housekeeping, but still, classification of these accidents indicates employees falling in many places where travel and work conditions were excellent. There have been very few injuries from falling where travel was bad such as in open stoping, over rough, broken ore which makes it appear that when hazards are obvious men are careful but where conditions look excellent, a small piece of debris can cause a person to slip and fall or turn an ankle because the man is not alert. Several of these injuries have been caused when men have been walking through shallow water and slipping on some object.

Falls of ground have decreased over the years, mainly because of use of back spiling and side support used before timbering. Injuries from this cause are usually severe. Most severe during the year was a fall of ground which later caused amputation of a leg. This man had been ordered away from this place by the foreman and miners because it was being barred down at the time, but the main reason for the accident was the fact that the man again came into the hazardous area and was struck by a chunk.

There were eleven compensable falls of ground injuries during the year.

Haulage caused ten compensable injuries and drilling equipment nine injuries.

For the first time in many years, explosives caused fatal accidents (3). Failure to coordinate work and failure to use proper methods were the causes of the fatal accidents. Another accident of unusual type occurred when leg wires from an electric detonator entered into a light socket as the employee was unraveling the wires. The extension light cord should have been removed before any charging was done.

At most of the open-pit mines and on surface at underground mines the frequency rating was good. The one fatal accident from haulage at the Sargent Open-Pit caused the severity to go high.

Accident Statistics

For the underground group, the Cambria-Jackson Mine had the best ratings and won the Barner Flag with a Frequency of 17.26 and Severity of 394.

The Ohio Mine was first in the open-pit group with no injuries and received this position because of the man-hours which was about twice as many as the Republic Mine which also went through the year without a lost-time injury.

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11. ACCIDENTS
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INJURYb. All InjuriesINTERPRETATION OF INJURY RATES

That injury frequency rates are much more significant than sets of abstract figures punctuated with decimal points is forcefully recognized when they are interpreted in terms of employees.

Using an average of 2,000 hours per employee per year, 1,000,000 hours represents the yearly exposure of about 500 employees. An injury frequency rate of 10.0 per 1,000,000 man-hours, then, indicates 10 disabling injuries per year among each 500 employees, or 1 injury among 50. In a plant with a frequency rate of 20.0 approximately one employee out of every 25 is suffering a disabling injury each year.

The severity rate is the number of days lost and charged per each 1,000,000 hours worked. Because of the inclusion of time charges, which generally are in excess of the actual number of days lost, it is incorrect to say that the rate represents days lost in relation to a given number of employees.

The severity rate actually is a single rate which measures both the frequency and severity of injuries. Whereas the frequency rate is determined by counting each injury as 1, regardless of the seriousness of the case, the severity rate is determined by counting each injury the number of times indicated by its time charge--i.e., according to its relative severity.

CLASSIFICATION OF COMPENSABLE INJURIES

- CLASSIFICATION -	AGNEW	BUNKER HILL	CAMBRIDA-JACKSON	CANISTEO	CLIFFS SHAFT	ELEC. POW. DIV.	HAWKINS	HILL-TRUMBULL	HOLMAN CLIFFS	HUMBOLDT	LLOYD	MAAS	MATHER MINE, "A" SHAFT	MATHER MINE, "B" SHAFT	MISC.-HIBBING	MISCELLANEOUS	OHIO	REPUBLIC	SARGENT	SPIES-VIRGIL	STHSE. & SHOPS	TILDEN	TOTAL
I. Trade Risk, Incidental And Non-Preventable		3	1	5	1	1	1	1	1	1	5	4									2		23
II. Negligence Of Company:																							
1. Failure To Use Safety Devices Provided																							0
2. Failure To Use Proper Tools Provided																							0
3. Violation Of Rules																							0
4. Improper Act Or Selection Of Method Of Doing Work (By Foreman)		1											1	1									3
5. Failure To Instruct Men As To Hazards, Method, Etc.																							0
6. Failure To Provide Safety Devices					2			1	1														4
7. Failure To Provide Tools, Appliances Or Places To Work					1																		1
III. Negligence Of Workmen:																							
A. Injured Workman																							
1. Failure To Use Safety Devices Provided																							0
2. Failure To Use Proper Tools, Etc. Provided																							0
3. Violation Of Rules			2							1	1	1											5
4. Improper Act Or Method Of Doing Work	1	10	1	2	11			3	1	1	5	12	13					2			1		63
B. Other Workman																							
1. Failure To Use Safety Devices Provided																							0
2. Failure To Use Proper Tools, Etc. Provided																							0
3. Violation Of Rules													1										1
4. Improper Act Or Method Of Doing Work	1		2									1	2										6

(Continued - Next Page)

11. ACCIDENTS AND PERSONAL INJURY

b. All Injuries

(Continued)

TABLE IV

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11. ACCIDENTS
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PERSONAL
INJURY

b. All Injuries

(Continued)

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CLASSIFICATION OF COMPENSABLE INJURIES

COMBINED
- CLASSIFICATIONS -

	AGNEW	BUNKER HILL	CAMBRIA-JACKSON	CANISTEO	CLIFFS SHAFT	ELEC. POW. DIV.	HAWKINS	HILL-TRUMBULL	HOLMAN CLIFFS	HUMBOLDT	LLOYD	MAAS	MATHER MINE, "A" SHAFT	MATHER MINE, "B" SHAFT	MISC.-HIBBING	MISCELLANEOUS	OHIO	REPUBLIC	SARGENT	SPIES-VIRGIL	STHSE. & SHOPS	TILDEN	TOTAL	
III-A-4 and III-B-4	4			1						1	1		1	2									10	
III-A-2 and III-A-4	1														1								2	
III-A-3 and III-B-3				1										1									2	
III-A-4 and II-4					1																		1	
III-A-4 and II-1					1																1		2	
III-A-2 and III-B-2								1															1	
II-3 and II-4													1										1	
TOTALS *	2	21	1	4	24	0	0	2	4	3	2	8	23	24	1	0	0	0	0	2	0	3	1	125

* Totals are for this page and preceding page.

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11. ACCIDENTS
AND
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INJURYb. All Injuries (Continued)

TABLE V

NUMBER OF MAN-SHIFTS WORKED
AND TONS OF ORE PRODUCED PER FATALITY

<u>YEAR</u>	<u>NUMBER OF FATALITIES</u>	<u>NUMBER OF MAN-DAYS WORKED PER FATALITY</u>	<u>NUMBER OF TONS OF ORE MINED PER FATALITY</u>
1936	2	283,945	1,850,898
1937	1	765,702	5,216,879
1938	3	163,434	385,954
1939	1	564,433	3,713,389
1940	5	142,878	1,156,387
1941	5	182,340	1,456,528
1942	2	512,356	3,808,258
1943	4	269,351	1,624,315
1944	3	331,090	1,995,787
1945	1	915,666	5,970,577
1946	0	747,079 *	4,416,253 **
1947	7	153,031	1,130,679
1948	3	386,965	2,869,090
1949	1	1,013,442	7,162,324
1950	5	233,060	1,647,066
1951	2	679,740	4,507,045
1952	5	239,483	1,493,841
1953	2	617,377	4,482,063
1954	0	884,848 *	6,280,483 **
1955	4	223,940	2,147,324
TOTALS	56	17,275,041	129,579,348
20 Year Average -	2.80	308,483	2,313,917

* Man-Days Worked During Year Without Fatality

** Amount Of Ore Mined During Year Without Fatality

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AND
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INJURYb. All Injuries

(Continued)

TABLE VI

RESUME OF ALL LOST TIME INJURIES & FATALITIES

<u>Mine Or Plant</u>	<u>Less Than 7 Days</u>	<u>7 Days Or More</u>	<u>Fatalities</u>	<u>TOTAL</u>
AGNEW	1	2		3
BUNKER HILL	8	21		29
CAMBRIA-JACKSON	4	1		5
CANISTEO	2	4		6
CLIFFS SHAFT	13	24		37
ELEC. POWER DIVISION	0	0		0
HAWKINS	2	0		2
HILL-TRUMBULL	0	2		2
HOLMAN CLIFFS	0	4		4
HUMBOLDT	2	3		5
LLOYD	3	2		5
MAAS	3	8		11
MATHER MINE, "A" SHAFT	18	21	2	41
MATHER MINE, "B" SHAFT	19	23	1	43
MISCELLANEOUS	1	0		1
MISCELLANEOUS - HIBBING	0	1		1
OHIO	0	0		0
REPUBLIC	0	0		0
RESEARCH LABORATORY	0	0		0
SARGENT (OPEN-PIT)	2	1	1	4
SPIES-VIRGIL	1	0		1
STHSE. & SHOPS	2	3		5
TILDEN	0	1		1
TOTALS	81	121	4	206

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(Continued)

TABLE VII

CAUSES OF COMPENSABLE INJURIES -- UNDERGROUND

CAUSE	AGNEW	BUNKER HILL	CAMBRIA-JACKSON	CLIFFS SHAFT	LLOYD	MAAS	MATHER MINE, "A" SHAFT	MATHER MINE, "B" SHAFT	SPIES-VIRGIL	TOTAL
Fall Of Ground		3	1	4			2	1		11
Falling Chunks (Shafts, Chutes, Raises)		1				1	1	2		5
Rolling Chunks		2		1		1		1		5
Persons Falling (Shafts, Raises, Scaffolds, Etc.)		1		2		1		1		5
Persons Falling (Slipping & Stumbling)		3		2	1	1	3	3		13
Haulage	1	1		1		1	4	2		10
Explosives							3	5		8
Drilling Equipment		2		3			2	2		9
Loading Equipment		1		1			1			3
Hand Tools		1				1				2
Flying Objects		2				1	1			4
Handling Materials	1			2			2			5
Lifting Or Pulling				2			1			3
Falling Or Moving Material		1				1	1	2		5
Cages And Skips				3						3
Falling Chute Door				1						1
Flying Particles				1						1
Nails Or Sharp Objects							1	1		2
Burns								1		1
Blasting Fumes								1		1
TOTALS	2	18	1	23	1	8	22	22	0	97

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(Continued)

TABLE VII (Cont'd.)

OPEN PITS

CAUSE	CANI STEO	HAW- KINS	HILL- TRUMBULL	HOLMAN CLIFFS	HUMB OLDT	OHIO	REPU BLIC	SARG -ENT	TIL DEN	TOTAL
Haulage	1							2		3
Persons Falling (Slipping & Stumbling)	1				1					2
Flying Particles	1		1							2
Machinery (Moving)	1			1	1					3
Handling Materials			1							1
Fall From Shovel Platform				1						1
Drilling Equipment				2						2
Hand Tools					1					1
Lifting Or Pulling								1		1
TOTALS	4	0	2	4	3	0	0	2	1	16

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(Continued)

TABLE VII (Cont'd.)

SURFACE (Undg. Mines)

CAUSE	AGNEW	BUNKER HILL	CAMBERIA-JACKSON	CLIFFS SHAFT	LLOYD	MAAS	MATHER MINE, "A" SHAFT	MATHER MINE, "B" SHAFT	SPIES-VIRGIL	TOTAL
Top Tram Car		1								1
Falling Materials		1								1
Haulage (Tunnel)		1								1
Flying Objects				1						1
Railroad Cars					1					1
Persons Falling (Slipping & Stumbling)							1			1
Handling Materials								1		1
Hand Tools								1		1
TOTALS	0	3	0	1	1	0	1	2	0	8

OTHER OPERATIONS

CAUSE	ELECTRIC POWER DIVISION	GARAGE, STHSE. & SHOPS	MISC. HIBBING	TOTAL
Persons Falling (Slipping & Stumbling)		2		2
Falling Materials		1		1
Falling From Chair			1	1
TOTALS	0	3	0	4

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TABLE VIII

FREQUENCY RATES, ALL COMPENSABLE INJURIES

<u>YEAR</u>	<u>TOTAL MAN DAYS WORKED</u>	<u>NUMBER OF COMPENSABLE INJURIES</u>		<u>FREQUENCY * RATE</u>
		<u>NON-FATAL</u>	<u>FATAL</u>	
1939	564,542	44	1	9.96
1940	714,391	59	5	11.19
1941	918,300	79	5	11.43
1942	1,024,713	75	2	9.39
1943	1,077,402 $\frac{1}{4}$	171	4	20.30
1944	993,272 $\frac{1}{2}$	121	3	15.61
1945	915,665 $\frac{3}{4}$	107	1	14.74
1946	747,079	101	0	16.89
1947	1,071,219	149	7	18.20
1948	1,160,896 $\frac{1}{4}$	145	3	15.94
1949	1,013,442	126	1	15.66
1950	1,165,301 $\frac{1}{2}$	145	5	16.09
1951	1,359,479 $\frac{3}{4}$	136	2	12.69
1952	1,197,416 $\frac{1}{2}$	152	5	15.87
1953	1,234,755 $\frac{1}{4}$	152	2	15.39
1954	884,848	99	0	13.99
1955	895,762	121	4	17.44

* Based on One Million Man-Hours Of Labor.

TABLE VIII-A

SEVERITY RATES, ALL COMPENSABLE INJURIES

<u>YEAR</u>	<u>NON-FATAL</u>		<u>FATAL DAYS LOST</u>	<u>DAYS LOST ALL INJURIES</u>	<u>SEVERITY * RATE</u>
	<u>DAYS LOST</u>	<u>RATE</u>			
1939	3,264	.723	6,000	9,264	2.051
1940	3,442	.602	30,000	33,442	5.852
1941	5,403	.735	30,000	35,403	4.819
1942	5,851	.500	12,000	17,851	2.177
1943	10,355	1.201	24,000	34,355	3.986
1944	7,759	.976	18,000	25,759	3.242
1945	7,624	1.041	6,000	13,624	1.860
1946	7,994	1.337	0	7,994	1.337
1947	9,946	1.161	42,000	51,946	6.062
1948	14,526	1.564	18,000	32,526	3.502
1949	5,833	.719	6,000	11,833	1.390
1950	7,063	.757	30,000	37,063	3.976
1951	10,657	.979	12,000	22,657	2.083
1952	17,716	1.849	30,000	47,716	4.981
1953	8,587	.869	12,000	20,587	2.084
1954	6,502	.919	0	6,502	0.919
1955	7,392	1.032	24,000	31,392	4.381

* Based on Days Lost By Injuries Per 1,000 Man-Hours Of Labor
except Year 1955 which is based on new rate - 1,000,000 Hours.

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TABLE IX

COMPARISON OF COMPENSABLE ACCIDENTS, INCLUDING FATALITIES
(BY MINES)

<u>Mine Or Plant</u>	<u>FREQUENCY</u>		<u>SEVERITY</u>	
	<u>1954</u>	<u>1955</u>	<u>1954</u>	<u>1955</u>
AGNEW	0.00	14.64	.000	915
BUNKER HILL	13.91	33.57	.737	1,122
CAMBRIA-JACKSON	3.10	3.45	.065	345
CANISTEO	21.49	14.40	.760	554
CLIFFS SHAFT	14.14	26.33	.754	4,233
ELEC. POWER DIVISION	0.00	0.00	.000	0
GENERAL ROLL	0.00	0.00	.000	0
HAWKINS	16.43	0.00	.900	0
HILL-TRUMBULL	5.06	7.39	.040	151
HOLMAN CLIFFS	0.00	15.60	.000	831
HUMBOLDT	23.59	16.87	1.209	337
LLOYD	29.50	10.62	2.070	621
MAAS	7.10	16.27	3.386	919
MATHER MINE, "A" SHAFT	18.11	22.32	1.390	12,352
MATHER MINE, "B" SHAFT	33.68	24.80	1.034	6,783
MISCELLANEOUS	0.00	0.00	.000	0
MISCELLANEOUS - HIBBING	0.00	24.16	.000	459
OHIO	0.00	0.00	.000	0
REPUBLIC	0.00	0.00	.000	0
SARGENT (OPEN-PIT)	47.80	62.77	2.247	189,517
SPIES-VIRGIL	17.74	0.00	.467	0
STHSE. & SHOPS	3.44	9.61	.062	670
TILDEN	0.00	71.03	.000	852
	<hr/>	<hr/>	<hr/>	<hr/>
All Properties	13.99	17.44	.919	4,381

Note: Severity rating for Year 1955 based on 1,000,000 Man-Hours
Of Labor.