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d. Production by Months

Crude Ore

Mo.	Retreat		North Star		Bingham		Retreat			Total
	Holman	Brown	Wash	Retreat	Wash	Retreat	Holman Lake	Brown Lake	North Star Lake	
	Apr	8,621	41,859	12,605	41,081			29,905		
May	50,983	251,868	1,289	13,684			60,709	10,993		389,526
June	81,592	199,860		13,997				81,153		376,602
Aug	5,398	268,265	1,034	30,178	612	17,658		66,287		389,432
Sept	43,334	177,746				103,794	59,890	551		385,315
Oct	47,855	280,291				175,696	29,166		48,684	581,692
	237,783	1,219,889	14,928	98,940	612	297,148	179,670	158,984	48,684	2,256,638

Concentrates

Mo.	Retreat				North Star		Bingham		Retreat			Total
	Holman		Brown		Wash	Retreat	Wash	Retreat	Holman Lake	Brown Lake	North Star Lake	
	Apr		3,600		21,595	10,329	23,552			11,082		
May		24,833		123,589	783	9,823			25,472	2,556		187,056
June		41,344		92,205		7,413				24,014		164,976
July				970								970
Aug		2,452		121,256	678	17,322	369	9,338		19,775		171,190
Sept		19,013		65,716				38,882	18,362	247		142,220
Oct	74	21,683	51	116,018				76,488	9,055		25,395	248,764
Nov		1,233		4,076							2,369	7,678
	74	114,158	51	545,425	11,790	58,110	369	124,708	63,971	46,592	27,764	993,012

3. ANALYSIS

a. Tonnage & Analysis of Crude Ore Produced

	<u>Crude Ore</u>	<u>Tons</u>	<u>Iron</u>	<u>Silica</u>
<u>Holman</u>				
Retreat		237,783	41.18	36.63
Lake Retreat		179,670	43.23	32.26
<u>Brown</u>				
Retreat		1,219,889	40.42	37.95
Lake Retreat		158,984	40.18	38.32

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<u>Crude Ore</u>	<u>Tons</u>	<u>Iron</u>	<u>Silica</u>
<u>North Star</u>			
Wash	14,928	51.42	21.51
Retreat	98,940	45.62	29.66
Lake Retreat	48,684	48.05	23.69
<u>Bingham</u>			
Wash	612	46.70	29.60
Retreat	<u>297,148</u>	<u>39.43</u>	<u>39.48</u>
	2,256,638	41.05	36.80

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>
<u>Holman</u>							
Bessemer	74	58.00	.042	11.35	.14	.40	5.40
Bessemer Retreat	57,423	57.14	.033	12.07	.19	.44	6.84
Non Bessemer Retreat	56,735	56.99	.047	11.73	.19	.45	6.89
Bessemer Lake Retreat	17,481	54.20	.044	15.75	.20	.72	7.50
Non Bessemer Lake Retreat	46,490	54.49	.046	15.28	.21	.63	7.43
<u>Brown</u>							
Bessemer Wash	51	57.50	.035	12.85	.14	.38	4.50
Bessemer Retreat	309,042	57.59	.034	12.60	.15	.41	6.40
Non Bessemer Retreat	236,383	57.04	.044	12.81	.16	.40	6.62
Bessemer Lake Retreat	20,216	57.14	.038	12.58	.19	.47	7.46
Non Bessemer Lake Retreat	26,376	56.89	.040	12.94	.17	.52	7.48
<u>North Star</u>							
Bessemer Wash	5,776	56.76	.039	12.42	.29	.42	8.53
Non Bessemer Wash	6,014	58.44	.044	9.91	.23	.47	7.79
Bessemer Retreat	45,716	57.99	.034	10.93	.26	.40	7.37
Non Bessemer Retreat	12,394	57.58	.035	11.81	.24	.39	6.93
Bessemer Lake Retreat	4,164	57.50	.044	9.71	.32	.48	9.00
Non Bessemer Lake Retreat	23,600	55.77	.050	11.62	.37	.53	9.10
<u>Bingham</u>							
Non Bessemer Wash	369	57.30	.052	12.70	.13	.92	10.30
Bessemer Retreat	81,442	57.68	.039	12.29	.19	.49	7.54
Non Bessemer Retreat	<u>43,266</u>	<u>57.37</u>	<u>.046</u>	<u>12.18</u>	<u>.23</u>	<u>.50</u>	<u>7.74</u>
	993,012	57.14	.040	12.56	.18	.45	6.96

6.97

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c. Tonnage & Complete Analysis of Concentrates Produced & Shipped

<u>Product</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Sil</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	202	58.00	.042	11.35	.14	.40	.10	.16	.016	4.75	5.40
Bessemer Retreat	59,592	57.02	.033	12.28	.19	.44	.10	.16	.016	5.13	6.83
Non Bessemer Retreat	56,690	57.02	.047	11.70	.19	.45	.10	.16	.016	5.67	6.90
Bessemer Lake Retreat	17,481	54.20	.044	15.75	.20	.72	.10	.16	.016	5.37	7.50
Non Bessemer Lake Retreat	46,490	54.49	.046	15.28	.21	.63	.10	.16	.016	5.50	7.43
<u>Brown</u>											
Bessemer Wash	276	57.50	.035	12.85	.14	.38	.10	.15	.015	4.01	4.50
Non Bessemer Wash	2,159	56.40	.048	13.34	.14	.36	.10	.15	.015	5.08	5.17
Bessemer Retreat	242,445	57.64	.032	12.56	.15	.41	.10	.15	.015	4.06	6.34
Non Bessemer Retreat	279,815	56.94	.046	12.69	.17	.38	.10	.15	.015	4.90	6.30
Bessemer Lake Retreat	20,216	57.14	.038	12.58	.19	.47	.10	.15	.015	4.63	7.46
Non Bessemer Lake Retreat	26,376	56.89	.040	12.94	.17	.52	.10	.15	.015	4.60	7.48
<u>North Star</u>											
Bessemer Wash	5,776	56.76	.039	12.42	.29	.42	.11	.16	.016	5.21	8.53
Non Bessemer Wash	6,014	58.44	.044	9.91	.23	.47	.11	.16	.016	5.35	7.79
Bessemer Retreat	65,665	57.84	.034	11.52	.24	.40	.11	.16	.016	4.67	6.98
Non Bessemer Retreat	10,748	57.76	.035	11.58	.24	.40	.11	.16	.016	4.72	6.90
Bessemer Lake Retreat	4,164	57.50	.044	9.71	.32	.48	.11	.16	.016	6.75	9.00
Non Bessemer Lake Retreat	23,600	55.77	.050	11.62	.37	.53	.11	.16	.016	7.18	9.10
<u>Bingham</u>											
Non Bessemer Wash	369	57.30	.052	12.70	.13	.92	.10	.16	.016	3.87	10.30
Bessemer Retreat	63,373	57.68	.037	12.32	.19	.48	.10	.16	.016	4.10	7.43
Non Bessemer Retreat	25,197	57.16	.048	12.17	.24	.48	.10	.16	.016	4.89	7.62
	956,648	57.07	.040	12.57	.18	.44	.10	.16	.016	4.77	6.77

d. Mine Analysis of Ore in Stockpile

<u>Retreat Concentrates</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>	<u>Moisture</u>
Holman	853	50.74	.025	21.73	.18	.38	6.30
Brown	95,687	57.34	.039	12.76	.16	.40	6.59
North Star	3,293	56.44	.036	13.34	.26	.36	7.12
Bingham	36,138	57.67	.044	12.20	.21	.53	7.91
	135,971	57.36	.040	12.68	.18	.43	6.95

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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	52		
	Retreat	14	0	40		
<u>Lease</u>	<u>Reserve 12-31-55</u>	<u>Mined 1956</u>	<u>Balance After Mining</u>	<u>Changed by Re-estimate</u>	<u>Reserve 12-31-56</u>	
North Star N $\frac{1}{2}$ -NE 21-56-24	408,165	69,899	338,266	+ 200,468	538,734	
Bingham NW-SE 21-56-24	1,533,233	125,077	1,408,156	+ 87,935	1,496,091	
Holman SE-NE 21-56-24	1,023,410	114,233	909,177	+ 258,382	1,167,559	
Brown No. 1 SW-NE 21-56-24	418,684	161,605	257,079	+ 335,324	592,403	
Brown No. 2 SW-NW 22-56-24	<u>1,975,661</u>	<u>383,871</u>	<u>1,591,790</u>	<u>+ 253,152</u>	<u>1,844,942</u>	
	5,359,153	854,685	4,504,468	+1,135,261	5,639,729	

b. Estimated Analysis of Ore Reserves

<u>Concentrates</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>
North Star				
Bessemer Wash	30,548	60.29	.038	9.78
Non Bessemer Wash	72,837	55.66	.049	9.30
Bessemer Retreat	189,037	55.15	.026	10.70
Non Bessemer Retreat	<u>246,312</u>	<u>55.15</u>	<u>.051</u>	<u>10.70</u>
	538,734	55.51	.041	10.46

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<u>Concentrates</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>
<u>Bingham</u>				
Bessemer Wash	329,717	60.14	.033	9.27
Non Bessemer Wash	190,282	60.36	.053	8.53
Bessemer Retreat	388,147	58.00	.032	11.43
Non Bessemer Retreat	<u>587,945</u>	<u>58.00</u>	<u>.051</u>	<u>11.43</u>
	1,496,091	58.77	.042	10.59
<u>Holman</u>				
Bessemer Wash	205,078	59.61	.031	9.29
Non Bessemer Wash	105,726	59.35	.054	8.93
Bessemer Retreat	567,811	57.24	.030	10.64
Non Bessemer Retreat	<u>288,944</u>	<u>57.24</u>	<u>.057</u>	<u>10.64</u>
	1,167,559	57.85	.039	10.25
<u>Brown No. 1</u>				
Bessemer Wash	61,333	60.51	.035	9.14
Non Bessemer Wash	42,611	60.29	.039	9.50
Bessemer Retreat	405,138	56.93	.029	12.32
Non Bessemer Retreat	<u>83,321</u>	<u>56.93</u>	<u>.046</u>	<u>12.32</u>
	592,403	57.54	.033	11.79
<u>Brown No. 2</u>				
Bessemer Wash	303,577	59.36	.028	9.31
Non Bessemer Wash	68,345	58.34	.059	9.04
Bessemer Retreat	884,183	57.21	.027	10.76
Non Bessemer Retreat	<u>588,837</u>	<u>57.21</u>	<u>.066</u>	<u>10.76</u>
	1,844,942	57.61	.041	10.46
<u>North Star & Bingham</u>				
Bessemer Wash	360,265	60.15	.033	9.31
Non Bessemer Wash	263,119	59.06	.052	8.74
Bessemer Retreat	577,184	57.07	.031	11.19
Non Bessemer Retreat	<u>834,257</u>	<u>57.16</u>	<u>.051</u>	<u>11.21</u>
	2,034,825	57.90	.042	10.55
<u>Holman & Brown</u>				
Bessemer Wash	569,988	59.57	.030	9.28
Non Bessemer Wash	216,682	59.22	.053	9.08
Bessemer Retreat	1,857,132	57.16	.029	11.06
Non Bessemer Retreat	<u>961,102</u>	<u>57.19</u>	<u>.062</u>	<u>10.86</u>
	3,604,904	57.67	.039	10.61

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<u>Concentrates</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>
<u>Total Wash</u>				
Bessemer	930,253	59.79	.031	9.29
Non Bessemer	<u>479,801</u>	<u>59.13</u>	<u>.052</u>	<u>8.89</u>
	1,410,054	59.57	.038	9.16
<u>Total Retreat</u>				
Bessemer	2,434,316	57.14	.029	11.09
Non Bessemer	<u>1,795,359</u>	<u>57.18</u>	<u>.057</u>	<u>11.02</u>
	4,229,675	57.16	.041	11.06
<u>Total Holman-Cliffs</u>				
Bessemer	3,364,569	57.87	.029	10.59
Non Bessemer	<u>2,275,160</u>	<u>57.59</u>	<u>.056</u>	<u>10.57</u>
	5,639,729	57.76	.040	10.58

5. LABOR & WAGES

a. Comments

There was practically no labor turnover and, except for a general strike, relations with the union were normal and satisfactory. A strike, called by the union on the wage issue on June 30, extended through August 6 and resulted in a sliding wage scale increase with additional fringe benefits and a 3-year contract.

b. Comparative Statement of Production & Wages

	<u>1956</u>	<u>1955</u>
Wash & Retreat Concentrates-Tons	993,012	1,105,062
Number of Days Mine Operated	142	147
Average Number of Men Working	169	160
Average Wages Per Day	\$22.32	\$20.65
Tons Per Man Per Day	41.27	47.20
Labor Cost Per Ton	\$0.541	\$0.440
Total Number of Man Days	24,062	23,546
Amount Paid for Labor	\$537,076.39	\$486,170.34

Note: Above comparative statement covers pit and lake concentrator.

6. GENERAL SURFACE

a. Buildings & Repairs

Normal maintenance work was carried on throughout the year on mine buildings and company-owned houses. \$2683 was expended, of which \$1786 was the cost of installing two new furnaces.

b. Roads, Transmission Lines, Etc.

Only minor changes were made in roads and transmission lines. A small settling pond was constructed to clarify pit water in compliance with State of Minnesota recommendations.

c. Miscellaneous General Construction

The tailings discharge line was moved to a new area in the tailings basin. Where necessary, the baffle and retaining dikes were raised.

Construction of the cyclone plant under E&A No. MC-281, underway in 1955, was continued and the plant put into operation the last week in June.

Construction of facilities for separating and loading of fine concentrates under E&A No. MC-300 was completed and the facilities put into use the first week in May.

7. OPEN PIT

a. Stripping

The following table shows material moved from the various leases and the actual-versus-estimated costs during 1956:

<u>Lease</u>	<u>E&A No.</u>	<u>Cubic Yards Surface</u>	<u>Cost</u>	
			<u>Estimated</u>	<u>Actual</u>
Bingham	MC-294	274,715	\$0.395	\$0.388
Bingham	MC-308	30,498	0.300	0.324
Bingham	MC-315	149,015	0.409	0.257
North Star	MC-315	<u>635,316</u>	0.409	0.257
		1,089,544		

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Surface stripping under E&A No. MC-294 was continued from 1955 in the southeast corner of the Bingham lease through January on a 3-shift, 5-day schedule and with concurrent stripping in June. In order to complete this program, an additional E&A, No. MC-308, was approved and completed in August.

Upon completion of the ore season, stripping was carried forward under E&A No. MC-315 on a 20-shift-per-week schedule, removing surface from the southeast corner of the Bingham and from the north side of the North Star lease, using one shovel serviced by an average of seven trucks. Under E&A No. MC-315, an average of 5,060 cubic yards per shift was maintained.

b. Open Pit Mining

The following table shows material mined from the various leases:

<u>Lease</u>	<u>Gross Crude</u>	<u>Screen Rock</u>	<u>Net Crude</u>	<u>Pit Rock Lean & Waste</u>	<u>Total</u>
Holman	271,983	34,200	237,783	31,342	303,325
Brown No. 1	407,702	46,291	361,411	51,664	459,366
Brown No. 2	968,437	109,959	858,478	131,633	1,100,070
North Star	143,078	29,210	113,868	12,795	155,873
Bingham	<u>335,410</u>	<u>37,650</u>	<u>297,760</u>	<u>15,127</u>	<u>350,537</u>
	<u>2,126,610</u>	<u>257,310</u>	<u>1,869,300</u>	<u>242,561</u>	<u>2,369,171</u>

Mining of crude ore from the pit started on April 17 and continued through May on a 2-shift, 6-day schedule with two shovels loading, five trucks hauling ore, and one truck hauling screen and pit rock. In June, a crew from the Canisteo mine was added and engaged in stripping and pit cleanup on the third shift until August 20. Because of a loss in production resulting from the strike from June 30 to August 7, ore operations in both pit and plant were put on a 3-shift, 6-day schedule which was maintained until the end of ore season, except for a period of three weeks in September when the crew from the Canisteo mine returned to that mine.

2,126,610 tons of gross crude were moved on 322 shifts at an average rate of 6,604 tons per shift. 257,310 tons of screen rock were removed, leaving a total net crude of 1,869,300 tons for a shift average of 5,805 tons.

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Holman Lease: Practically all crude mined was retreat from the west end of the pit.

Brown No. 1 Lease: Crude ore was mined from an old retreat stock-pile and from the northcentral part of the property under the stock-pile. The material was all retreat ore.

Brown No. 2 Lease: Retreat ore was mined from upper benches along the east and north sides of the forty. This was material that in the past carried too high a silica, but with the advent of the cyclone plant produced a fair grade of concentrates.

North Star Lease: The majority of the crude ore mined was from the north side of the NW-NE and was approximately 87 per cent retreat and 13 per cent wash crude.

Bingham Lease: All mining was from an area above the paint rock layer in the southeast corner of the property. Approximately .2 per cent was wash and the balance retreat crude.

Operating conditions were average throughout the season and no serious delays were encountered. Cost of producing crude ore in 1956 was \$0.226 per ton as compared to \$0.213 in 1955. 242,561 tons of pit rock, lean, and waste material were moved and placed on respective dumps at a ratio of 0.28 tons of waste per ton of ore and at a cost of \$0.064 per ton of shipping ore.

c. Pumping & Drainage

The discharge line from the pit pump was moved to the southeast corner of the pit in order to release an area for mining. The flow of water remained constant, and the pumping cost per ton of concentrates was \$0.027 as compared to \$0.024 in 1955.

d. General Pit Activities

Only minor road and transmission line changes were necessary during the year, and the cost was \$0.017 per ton of concentrates as compared to \$0.014 per ton in 1955.

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8. BENEFICIATION

a. Pit Plant

The plant operated on the same schedule as the pit, treating wash and retreat ores as required. When on a 2-shift schedule, repairs were made on the third shift; and when on a 3-shift schedule, repairs were made on Sunday.

1,869,300 tons of crude ore treated produced 854,685 tons of concentrates at an average production rate of 2,654 tons per shift and a net weight recovery of 45.7 per cent.

Of the wash ore portion of the feed, 15,540 tons produced 12,284 tons of concentrates at a weight recovery of 79 per cent; the crude retreat feed of 1,853,760 tons produced 842,401 tons of concentrates at a weight recovery of 45.4 per cent.

Total net weight recovery was 45.7 per cent as compared to 54.4 in 1955. Average crude feed was 5,805 tons per shift as compared to 5,767 tons per shift in 1955. Concentrates were produced at the rate of 2,654 tons per shift as compared to 3,140 in 1955.

During the season it was necessary to stockpile 174,093 tons of concentrates which, added to a 99,607-ton balance carried over from 1955, made a total of 273,700 tons in stockpile; 137,729 tons were shipped from stock intermittently from April 10 to November 27; leaving a balance of 135,971 tons in stockpile as of December 31, 1956.

The only change in the flowsheet during 1956 was the construction of a cyclone plant to treat the $-1/8/65$ mesh material. This installation began operations in June; however, because of starting bugs and strike delays, the cyclone plant was not effective until the latter part of September. At that time a lowering of the silica content in this fraction of the ore was attained, but a severe lowering of weight recovery was effected. Considerable fine ore was being lost and work is under way to correct this condition for the 1957 season.

Facilities for separate loading of $-1/8$ inch concentrates were put into use the first week in May and were used intermittently throughout the season.

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Operations were normal and no serious delays were encountered.
Following is a tabulation of lost time due to delays:

Washing Plant

<u>Source of Delay</u>	<u>Hours</u>	<u>Per Cent of Total Working Hours</u>
Out of Ore	1.67	0.06
Crude Ore Pocket	2.67	0.10
8' Pan Conveyor	8.83	0.34
Pit Screen	3.00	0.12
Crude Conveyors	3.66	0.14
Primary Screens	0.75	0.03
Crushers	3.08	0.12
Secondary Screens	2.33	0.09
Concentrate Conveyors	9.00	0.35
Cyclone Feed Conveyors	0.33	0.01
Railroad Cars & Tracks	0.33	0.01
Tailings Pumps	7.09	0.27
Tailings Line	24.50	0.95
Chutes & Launderers	0.67	0.03
Clear Water Pumps	3.00	0.12
Air Compressor	1.25	0.05
Electric Power	3.58	0.14
Miscellaneous Heavy-Media Plant	19.00	0.74
Freezing Weather	20.50	0.80
	<u>115.24</u>	<u>4.47</u>

Recapitulation

Crude Ore to Head of Mill	19.83	0.77
Freezing Weather	20.50	0.80
Ore Processing Delays	<u>74.91</u>	<u>2.90</u>
	<u>115.24</u>	<u>4.47</u>

Heavy-Media Plant

Miscellaneous Washing Plant	72.08	2.81
Coarse Heavy-Media Conveyors	0.50	0.02
Coarse Reject Drain Screen	4.00	0.16
Coarse Reject Wash Screen	1.58	0.06
Circulating Media Pumps	1.17	0.05

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Heavy-Media Plant

<u>Source of Delay</u>	<u>Hours</u>	<u>Per Cent of Total Working Hours</u>
16' Thickener Underflow Pump	1.00	0.04
50' Thickener	1.67	0.07
Recirculating Water Pump	2.67	0.10
Reject Pocket	0.42	0.02
Waiting for Reject Truck	5.66	0.22
Electric Power	0.33	0.01
Freezing Weather	20.50	0.80
	<u>111.58</u>	<u>4.36</u>

Recapitulation

Crude Ore to Head of Mill	72.08	2.82
Freezing Weather	20.50	0.80
Ore Processing Delays	19.00	0.74
	<u>111.58</u>	<u>4.36</u>

b. Lake Concentrator

Operations at the Lake Concentrator began on April 16 on a 6-day, 2-shift schedule and, except for a strike period, continued on this schedule until the end of ore season on October 31. Operations were carried forward with one shovel loading, serviced by two trucks hauling crude ore and a third truck moving pit rock, screen rock, and rejects.

Material moved from stockpile is shown as follows:

<u>Stockpile</u>	<u>Gross Crude</u>	<u>Screen Rock</u>	<u>Net Crude</u>	<u>Pit Rock</u>
Holman	239,430	59,760	179,670	30,798
Brown	187,829	28,845	158,984	10,818
North Star	64,659	15,975	48,684	1,026
	<u>491,918</u>	<u>104,580</u>	<u>387,338</u>	<u>42,642</u>

387,338 tons of net crude treated produced 138,327 tons of concentrates at a net weight recovery of 35.7 per cent and an average production rate of 501 tons of concentrates per shift. This compares to a net recovery of 40.7 per cent and 652 tons per shift in 1955.

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The plant operated satisfactorily with the lower production due to a sharp decrease in recovery. The average grade of concentrates produced was better than anticipated.

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-Miscellaneous	16.83	0.74
Out of Ore-Shovel Repairs	53.58	2.36
Scalping Screen	0.75	0.03
Primary Screen	0.25	0.01
Crusher	0.50	0.02
Feed Preparation Screen	6.25	0.28
Circulating Media Pump	20.83	0.92
Densifier	4.00	0.18
Heavy-Media Float Screen	0.50	0.02
Rock Pocket	4.42	0.20
Rock Truck	0.25	0.01
Spiral Feed Line	0.50	0.02
Spiral Feed Pump	1.00	0.04
Railroad Cars & Tracks	59.68	2.63
Tailings Line	0.75	0.03
Chutes & Launderers	2.00	0.09
Charging Plant	20.50	0.90
Electric Power	8.24	0.36
DC Generator	6.50	0.29
Clear Water Pump	6.92	0.30
Freezing Weather	<u>38.50</u>	<u>1.70</u>
	252.75	11.13

Recapitulation

Crude to Head of Mill	71.16	3.13
Freezing Weather	38.50	1.70
Ore Processing Delays	<u>143.09</u>	<u>6.30</u>
	252.75	11.13

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Concentrating data for the wash, retreat, and Lake Concentrator products is shown as follows:

<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	15,540	100.00	81.54	51.23		21.83	
Pit Rock	480		2.52	26.10		57.98	
Screen Plant Rock	3,038		15.94	26.27		57.63	
Pit Crude	19,058		100.00	46.63		28.45	
Total Concentrates Produced	12,159	78.24	63.80	57.63	.041	11.21	88.01
Stockpile Overrun-1955*	125	.81	.66				
Total Concentrates Produced & Shipped	12,284	79.05	64.46	57.63	.041	11.21	88.93
Total Fine Tailings (by difference)	3,256	20.95	17.08	27.06		61.91	

*125 tons Brown wash 1955 stockpile overrun included in total.

Retreat Product

Crude to Plant	1,853,760	100.00	85.22	40.64		37.58	
Pit Rock	67,110		3.09	24.36		60.48	
Screen Plant Rock	254,272		11.69	25.28		59.45	
Pit Crude	2,175,142		100.00	38.34		40.84	
Total Concentrates Produced	841,002	45.37	38.66	57.41	.039	12.34	64.10
Stockpile Overrun-1955	1,399	.07	.07				
Total Concentrates Produced & Shipped	842,401	45.44	38.73	57.41	.039	12.34	64.20
Heavy-Media Concentrates	542,773	29.28	24.95	58.22		10.99	
Heavy-Media Rejects	294,497	15.89	13.54	39.48		38.74	
Heavy-Media Feed	837,270	45.17	38.49	51.64		20.73	
Total Fine Tailings (by difference)	716,862	38.67	32.95	21.40		66.77	

Lake Concentrator Retreat Product

Crude to Plant	387,338	100.00	72.46	42.58		33.67	
Pit Rock	42,642		7.98	29.29		53.06	
Screen Plant Rock	104,580		19.56	36.46		42.35	
Pit Crude	534,560		100.00	40.32		36.92	
Total Concentrates Produced	138,327	35.71	25.88	55.61	.044	13.73	46.64
Heavy-Media Concentrates	86,859	22.42	16.25	55.08		14.22	
Heavy-Media Rejects	91,580	23.65	17.13	40.08		36.65	
Heavy-Media Feed	178,439	46.07	33.38	49.42		23.12	
Total Fine Tailings (by difference)	157,431	40.64	29.45	32.59		49.46	

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9. MAINTENANCE & REPAIRS

The usual maintenance of mine and plant equipment was carried forward throughout the operating season.

Winter & Idle repairs at the plants were completed early in January and crews were then engaged in construction of the cyclone plant and installation of separate fines loading facilities until the start of ore season on April 17. Upon completion of the ore season on October 31, plant crews started the usual dismantling inspection and necessary repairs to plant equipment which continued until the end of the year.

In the shops a small crew made necessary major repairs to shovels, trucks, tractors, and drills from the end of the stripping operations on January 28 to the start of the ore season.

10. COST of OPERATIONS

a. Comparative Cost of Operation

<u>Pit Product</u>	<u>1956</u>	<u>1955</u>	<u>1956 Budget</u>
Crude Ore Tonnage	1,869,300	1,695,603	1,798,798
Concentrate Tonnage	854,685	923,209	903,638
Per Cent Recovery	45.72	54.45	50.24
Average Shift Output	2,654	3,140	3,000
Tons Per Man Per Day	44.52	50.69	
Shifts Operated	322	294	300
<u>Pit Costs</u>			
Pit Operating	\$0.226	\$0.213	\$0.242
Concentrating	0.225	0.181	0.224
Misc. Pit & Beneficiation	0.115	0.089	0.114
General Mine Expense	0.128	0.115	0.138
Winter & Idle	0.346	0.300	0.259
Cost of Production	<u>\$1.707</u>	<u>\$1.327</u>	<u>\$1.607</u>

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Lake Concentrator

Crude Ore Tonnage	387,338	446,391	553,146
Concentrate Tonnage	138,327	181,853	157,552
Per Cent Recovery	35.71	40.74	28.48
Average Shift Output	501	652	500
Tons Per Man Per Day	28.43	34.10	
Shifts Operated	276	279	315

Lake Concentrator Costs

Feeding	\$0.684	\$0.472	\$0.632
Concentrating	0.696	0.640	0.724
General Mine Expense	0.236	0.196	0.239
Winter & Idle	0.259	0.300	0.259
Cost of Production	\$1.875	\$1.608	\$1.854

b. Cost Comments

Pit: Cost of production for 1956 was \$0.380 higher than 1955 and \$0.100 higher than the budget. Compared with 1955 costs, all costs were increased in 1956 due to increased labor and supply costs and a decrease in recovery from 54.4 in 1955 to 45.7 in 1956. Increases were uniform throughout the various items making up this caption.

Cost of production was \$0.100 higher in 1956 than the budget estimate due in part to a lower recovery being realized than estimated. Winter & Idle items had the widest variation, \$0.087, because of lower production of concentrates than estimated with a slight increase in money expended.

Lake Concentrator: Cost of production for 1956 was \$0.268 higher than in 1955 and \$0.021 higher than the 1956 budget. Compared to 1955 costs, the increases were uniform throughout the various items and were due partly to higher wage and supply costs and partly to a decrease in recovery from 40.7 per cent in 1955 to 35.7 in 1956.

Cost of production in 1956 was slightly higher than the budget due to an increase in "feeding", resulting from several large repair jobs and an accumulation of numerous small breakdowns of the old 120-B shovel. All other items were slightly under the budget.

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11. EXPLORATION & FUTURE EXPLORATION

There was no regular exploration drilling at this property during the year.

During October and November, a Joy #225 truck-mounted rotary drill was loaned from Michigan to be used experimentally in drilling holes in various areas and ore horizons in the pit in an attempt to core soft and semi-hard ores for better information on ore bodies. Results in general were unsatisfactory and are the subject of a separate report.

It will be necessary during 1957 to resume drilling along the east side of the Bingham and Brown #1 leases to definitely outline the ore body in this area for future stripping programs.

12. TAXES

	1956		1955		Increase-Decrease	
	Assessed		Assessed		Assessed	
	Value	Taxes	Value	Taxes	Value	Taxes
<u>Real Estate</u>						
Mineral	\$668,892	\$119,270.13	\$ 965,893	\$161,825.71	-\$297,001	-\$42,555.58
Land, Bldg, Machinery	154,997	27,954.18	122,672	20,921.18	32,325	7,033.00
<u>Personal Property</u>						
Equipment	83,763	15,034.61	86,524	14,608.57	- 2,761	426.04
Stockpile Concts	1,748	311.68	15,754	2,639.43	- 14,006	- 2,327.75
Lake Conct SP Only	49,997	9,502.18	62,488	11,353.22	- 12,491	- 185.04
	<u>\$959,397</u>	<u>\$172,072.78</u>	<u>\$1,253,331</u>	<u>\$211,348.11</u>	<u>-\$293,934</u>	<u>-\$39,275.33</u>
Average Mill Rate		179.36		168.63		- 10.73

Average mill rate increased by 6.36 per cent. Mineral valuation reduced by production and new estimate by tax commission, although mineral values were increased by 5 per cent and are valued under Minnesota Recovery Law at 47 per cent of full and true value instead of 50 per cent of full and true value. All building values in Village of Taconite were increased 25 per cent and land values were increased approximately 20 per cent in Iron Range Township. Equipment decreased by normal depreciation plus addition of 150-B Bucyrus Erie shovel and AW road grader. Lake Concentrator stockpiles decreased by production per ton; tax rate value was increased from \$0.156 per ton to \$0.264.

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13. ACCIDENTS & PERSONAL INJURY

There were four compensable accidents during the year:

<u>Name</u>	<u>Date</u>	<u>Injury</u>		<u>Cause</u>	<u>Time Lost</u>		<u>Compensation Paid</u>
		<u>Nature</u>			<u>Days</u>	<u>Wks</u>	
Morten Jensen	2-14	Contusion	3 toes	Dropped iron on right foot.	3	4	\$184
Robert Boatman	3-27	Basal fracture and Kidney injury		Fell 8' through opening in cyclone plant floor during construction.	4	7	\$232
Edward Hoey	4-23	Contusion	3 toes	Wrench fell on foot.	5	1	\$33.34
Mike Markovich	8-7	Heat Exhaustion		Heat plus poor physical condition.	4	1	\$26.67

14. NEW CONSTRUCTION

a. Completed in 1956

- # 281 1. Cyclone plant for treatment of -1/8" material.
200 2. Facilities for separate loading of coarse-fines concentrates.

b. To Be Completed in 1957

- 333 1. Revision of Media Reclamation Circuit.
334 2. Clear Water Reclamation from Tailings Pond.
335 3. New Tailings Pumps Drives.
313-5 4. 1/4" Coarse-Fines Split Facilities.

15. EQUIPMENT RECEIVED & PROPOSED NEW EQUIPMENT

a. Received during 1956

- ? # 197 Austin-Western Grader
295 D-7 Tractor
318 DW-6 Tractor
Ford Tandem Truck & Trailer (District)
306 Ford 1/2-ton Pickup (District)
307 425' of 30" Conveyor Belting
✓ 1000 KVA Transformer
323 Ozalid Blueprint Machine

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FINANCE

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b. Proposed Equipment for 1957

- 327 3 Ford 1/2-ton Pickups
(1 for the District and 2 for the Holman)

SALLY MINE
ANNUAL REPORT
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1. GENERAL

An economic study made in 1955 indicated that considerable savings in mining costs would result by hauling Sally ore to the Canisteco mine for concentration rather than erecting a plant and other necessary facilities at the Sally mine for ore concentration. This study included a comparison of capital expenditures, salaries and wages, including unemployment compensation, SUB, and Winter & Idle costs. A saving of approximately \$3,000,000 was indicated on an estimated concentrate tonnage of 2,000,000.

As a result, plans were formulated to start stripping operations in the fall of 1956, with ore haulage to take place prior to the start of the 1957 ore season. The Great Northern Railway Company was advised it would be necessary to reroute its access railroad to the Danube mine and was requested to have its tracks removed from the Sally property by December 1, 1956.

Actual Sally mine stripping operations under E&A No. CC-851 were started on December 7 on a 20-shift-per-week schedule which continued into 1957. During December, 381,172 cubic yards of surface stripping were removed at an average rate of 6,050 cubic yards per shift.

2. PRODUCTION-SHIPMENTS-INVENTORIES None
3. ANALYSIS None
4. ESTIMATE of ORE RESERVES

a. Developed Ore - Factors Used

	<u>Cubic Feet</u> <u>Per Ton</u>	<u>Rock</u> <u>Deduction</u>	<u>Per Cent</u> <u>Recovery</u>
Merch	14	0	100.00
Wash	14	0	56.76
Lean Wash	14	0	45.85
Low Grade Wash	14	0	58.38
Lean Low Grade Wash	14	0	50.50
Retreat	14	0	40.00

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b. Ore Reserves as of December 31, 1956

<u>Lease</u>	<u>Reserve</u> <u>12-31-49</u>	<u>Mined</u> <u>1956</u>	<u>Balance</u> <u>After Mining</u>	<u>Changed by</u> <u>Re-estimate</u>	<u>Reserve</u> <u>12-31-56</u>
Bovey #1 NW-SW 21, 56-24	1,507,801		1,507,801	+243,778	1,751,579

c. Estimated Analysis of Ore Reserves

<u>Concentrates</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>
Bessemer Merch	88,457	64.01	.020	5.50
Non Bessemer Merch	63,657	62.12	.078	5.59
Bessemer Wash	755,429	60.92	.026	7.85
Non Bessemer Wash	450,438	58.89	.067	8.65
Bessemer Retreat	229,073	58.33	.031	11.73
Non Bessemer Retreat	164,525	57.73	.061	10.03
	<u>1,751,579</u>	<u>59.96</u>	<u>.042</u>	<u>8.57</u>

Merch

Bessemer	88,457	64.01	.020	5.50
Non Bessemer	63,657	62.12	.078	5.59
	<u>152,114</u>	<u>63.22</u>	<u>.044</u>	<u>5.54</u>

Wash Concentrates

Bessemer	755,429	60.92	.026	7.85
Non Bessemer	450,438	58.89	.067	8.65
	<u>1,205,867</u>	<u>60.16</u>	<u>.041</u>	<u>8.15</u>

Retreat Concentrates

Bessemer	229,073	58.33	.031	11.73
Non Bessemer	164,525	57.73	.061	10.03
	<u>393,598</u>	<u>58.08</u>	<u>.044</u>	<u>11.02</u>

Total Sally

Bessemer	1,072,959	60.62	.027	8.48
Non Bessemer	678,620	58.91	.067	8.70
	<u>1,751,579</u>	<u>59.96</u>	<u>.042</u>	<u>8.57</u>

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5. LABOR & WAGES

a. Comments

Canisteco mine personnel were transferred to the Sally mine for stripping operations, with the union contract in effect in the Western District being applicable at the Sally mine.

b. Comparative Statement of Production & Wages None

6. SURFACE

a. Buildings & Repairs

Construction of a combination pit office-service garage, authorized under E&A No. CC-854, was started in November and is scheduled for completion in January, 1957. The steel building was furnished and is being erected by Mipac Builders Incorporated of Duluth, Minnesota, at an estimated cost, including all auxiliary facilities, of \$34,200.

b. Roads, Transmission Lines, Etc.

In order to provide power for Sally stripping and mining operations, 22,000 and 2,300 volt transmission lines were installed between the Canisteco and Sally mines, thus supplying power for both properties through a common metering station and resulting in savings in power costs.

Installation of power lines, authorized under E&A No. CC-748 for \$41,060 was completed in December. Actual costs were within the budget.

An ore haul road between the Sally and Canisteco mines was constructed during 1956 by the A. Maturi Corporation at a contract price of \$20,985 as authorized under E&A No. CC-837. Actual costs were well below the budget.

c. Miscellaneous General Construction None

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7. OPEN PIT

a. Stripping

Surface stripping at the Sally mine was started on December 7 under E&A No. CC-851 with 2 shovels and 11-13 trucks operating on a 20-shift-per-week schedule. \$403,630 was authorized to remove 930,000 cubic yards of surface overburden at a cost of \$0.434 per cubic yard, including depreciation. In December, 381,172 cubic yards were removed at a cost of \$0.276 per cubic yard, for a total of \$105,495.

Stripping operations at the Sally mine continued into 1957 with completion scheduled for February 15.

b. Open Pit Mining

There were no ore operations in the Sally mine in 1956. It is planned to haul 670,000 tons of Sally crude ore to the Canisteo mine between February 15 and March 15, 1957, for concentration at the Canisteo plant during the 1957 ore season.

c. Pumping & Drainage

None

8. BENEFICIATION

None

9. MAINTENANCE & REPAIRS

None

10. COST of PRODUCTION

None

11. EXPLORATION & FUTURE EXPLORATION

Under E&A No. CC-851, a further expenditure of \$12,405 was authorized to cover 690 feet of structure drilling in connection with current development of the Sally mine. It is planned to drill in the spring of 1957. Present estimates indicate that an additional 5,110 feet of drilling will be required for total development of the Sally ore body.

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12. TAXES

<u>Real Estate</u>	<u>1956</u>		<u>1955</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	\$242,704	\$41,946.53	\$231,247	\$37,320.95	\$11,457	\$4,625.58
Land, Bldg, Machinery	666	122.18	666	115.79		6.39
	<u>\$243,370</u>	<u>\$42,068.71</u>	<u>\$231,913</u>	<u>\$37,436.74</u>	<u>\$11,457</u>	<u>\$4,631.97</u>
Average Mill Rate		172.86		161.43		10.71

Mineral values in Itasca County were increased by 5 per cent by State Tax Commission.

- 13. ACCIDENT & PERSONAL INJURY None
- 14. PROPOSED NEW CONSTRUCTION None
- 15. EQUIPMENT RECEIVED & PROPOSED NEW EQUIPMENT None

MAY 13 1956
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 COUNTY CLERK JOHN CO.
 STEAMBOAT OHIO

SARGENT OPEN PIT MINEANNUAL REPORTYEAR 19561. GENERAL

Repairs to automotive and Wanless mine equipment were carried on during January and February. Wanless mine equipment returned the early part of March included an Allis-Chalmers and a Model D-8 tractor, a Caterpillar Model 12 grader, and a road sprinkler truck; other shop equipment was returned to the Wanless at a later date; the pit foreman and master mechanic at the Sargent returned to the Wanless. A 3-man crew from the Hawkins mine started repair work on the Bucyrus-Erie shovel during the latter part of March. All repair work was done on a 1-shift, 5-day schedule. During this time, a small amount of trespass crude ore was stocked to the Sargent account in the Mesabi Chief pit by the M. A. Hanna Company.

On April 23, the shovel was moved into the pit for cleanup operations and a large part of the material moved was used to widen roads and strengthen the dyke. Soft spots in the road and on the dump hampered operations. Stripping and cleanup under E&A No. CC-799 were continued until May 14 when ore operations began. The pit worked on a 1-shift, 6-day-week schedule, and the plant worked on a 2-shift, 6-day-week schedule with three men on each shift. The Bucyrus-Erie 3-1/4 yard shovel and five 22-ton Euclids were used on pit cleanup; three trucks were used on the ore haul from the pit to the screening plant; two trucks from the screening plant to the washing plant stockpile; and one truck for scalped rock from the screening plant. No direct ore was mined. Two men were added to the crew drilling and blasting in the south bank of the south channel. Labor relations were good and weather conditions favorable.

Most of the crude ore for the season was obtained from the south channel and some from the bottom on the west side. Trespass ore obtained from the Hanna Company was mined mostly in the area directly west of the Sargent pit, with some coming from the line north and south of the present pit area.

On June 30, the shovel was moved out of the pit and all equipment spaced around the shop because of an impending steel strike. During this period, salaried employees were scheduled as watchmen. Men returned to work on August 7, 1956.

The first ore loaded was from a small pile back of the shop. Because the pit could not supply all the crude ore necessary for a 2-shift operation at the washing plant, it was worked overtime; the plant

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was put on a 1-shift schedule; and finally in August the plant was shut down for ten days while the shovel cleaned up an upper lift in the south channel to make ore available from the lower level. This crude proved adequate to complete the ore season. The ratio of crude ore, surface, and cave material to concentrates in 1956 was 3.1::1 as compared to 2.3::1 in 1955.

In September, the Pacific Isle Mining Company again used the Sargent screening and loading facilities for processing their Mississippi mine ore, loading 160 Great Northern ore cars for about 7,500 tons of crude. 222.5 pump hours of water totalling \$511.75 were purchased by Cliffs from Pacific Isle Mining Company; this was sufficient water to process the 88,630 tons of crude put through the washing plant for the season.

The ore season was concluded in October; On October 22, stripping was started under E&A No. CC-850 on a 3-shift, 5-day-per-week schedule, stripping wholly in the south channel and extending this area further east in the caves. October and November operating conditions were relatively good, but December weather was cold and unfavorable. Stripping ceased on December 15 and operating crews were transferred to the Hawkins for their stripping program. The shovel and other equipment were placed around the shops for repairs.

The M. A. Hanna Company completed its power line on our property and also the approach road along our north line to the Mississippi mine which Hanna is presently stripping. In addition to the 71,961 tons of concentrates produced at the Sargent operation, the M. A. Hanna Company also produced 27,712 tons of Sargent Heavy-Density concentrates and 2,720 tons of Sargent direct shipping ore, making a total of 30,432 tons they delivered to Cliffs account from trespass operations. As of December 31, they have in stockpile approximately 10,230 tons of Sargent trespass crude ore.

There was no structural drilling during the season nor any construction work. A drainage ditch was completed from the site of the proposed new pit in the northeast corner, around the east end of the screening plant tail track, and westerly to the north pit. This work was done with the bulldozer intermittently.

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2. PRODUCTION-SHIPMENTS-INVENTORIES

a. Production by Grades

<u>Product</u>	<u>Crude</u>	<u>Concentrates</u>
Sargent	88,630	71,961
Trespass	57,710	27,712
Trespass Direct		2,720
	<u>146,340</u>	<u>102,393</u>

b. Shipments (Same as Production)

c. Inventories None

d. Production by Months

<u>Month</u>	<u>Crude</u>			<u>Concentrates</u>			
	<u>CCI</u>	<u>Trespass</u>	<u>Total</u>	<u>CCI</u>	<u>Trespass</u>	<u>Direct</u>	<u>Total</u>
May	16,641		16,641	13,272			13,272
June	28,247	33,604	61,851	22,103	15,905		38,008
July				54			54
Aug	13,985		13,985	11,372		2,720	14,092
Sept	12,595		12,595	10,260			10,260
Oct	<u>17,162</u>	<u>24,106</u>	<u>41,268</u>	<u>14,900</u>	<u>11,807</u>		<u>26,707</u>
	88,630	57,710	146,340	71,961	27,712	2,720	102,393

3. ANALYSIS

a. Tonnage & Analysis of Crude Ore

<u>Tons</u>	<u>Iron</u>	<u>Silica</u>
88,630	52.09	19.00

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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	71,961	55.84	.057	13.21	.69	1.26	.32	.20	.010	4.04	11.54
Trespass Concentrates	27,712	56.19	.063	11.11	.61	.88	.31	.20	.011	6.13	8.35
Trespass Direct	<u>2,720</u>	<u>55.34</u>	<u>.053</u>	<u>12.10</u>	<u>.83</u>	<u>2.47</u>	<u>.31</u>	<u>.21</u>	<u>.011</u>	<u>4.46</u>	<u>15.63</u>
	102,393	55.92	.059	12.61	.67	1.19	.32	.20	.010	4.62	10.79

4. ESTIMATE of ORE RESERVES

<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, 1956

<u>Sargent Mine</u>	<u>Reserve 12-31-55</u>	<u>Mined 1956</u>	<u>Changed by Re-estimate</u>	<u>Reserve 12-31-56</u>
NE-SE 23, 57-22 Open Pit				
Merch	43,000			43,000
Wash Concentrates	<u>28,000</u>		<u>/ 29,000</u>	<u>57,000</u>
	71,000		<u>/ 29,000</u>	100,000
SW-SE 23, 57-22 Open Pit				
Merch	10,000			10,000
Wash Concentrates	<u>40,000</u>	<u>53,873</u>	<u>/ 78,873</u>	<u>65,000</u>
	50,000	53,873	<u>/ 78,873</u>	75,000

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Sargent Mine Open Pit	Reserve 12-31-55	Mined 1956	Changed by Re-estimate	Reserve 12-31-56
<u>SE-SE 23, 57-22</u>				
Merch			+ 2,000	2,000
Wash Concentrates			+ 23,000	23,000
			+ 25,000	25,000
<u>NW-NE 26, 57-22</u>				
Wash Concentrates	25,000	18,088		6,912
<u>Hanna Trespass</u>				
<u>NW-SE 23, 57-22</u>				
Retreat Concentrates		15,907	+ 15,907	
<u>Hanna Trespass</u>				
<u>SW-SE 23, 57-22</u>				
Merch		2,720	+ 2,720	
Retreat Concentrates		11,805	+ 11,805	
		14,525	+ 14,525	
<u>Total Sargent Open Pit</u>				
Merch	53,000	2,720	+ 4,720	55,000
Wash Concentrates	93,000	71,961	+ 130,873	151,912
Retreat Concentrates		27,712	+ 27,712	
	146,000	102,393	+ 163,305	206,912

(Estimate Based to Exhaust Mine)

c. Estimated Analysis of Reserves

Open Pit	Tons	Non-Bess	Iron	Phos	Silica	Mang	Alum	Moist	Natural	
									Iron	Silica
<u>NE-SE 23, 57-22</u>										
Merch	43,000		54.34	.057	12.78	1.22	2.09	14.00	46.73	10.99
Wash Concentrates	57,000		56.96	.082	6.83	.81	1.46	12.00	50.12	5.87
	100,000		55.83	.071	9.39	.99	1.73	12.87	48.64	8.08
<u>SW-SE 23, 57-22</u>										
Merch	10,000		54.34	.057	12.78	1.22	2.09	14.00	46.73	10.99
Wash Concentrates	65,000		55.84	.057	13.21	.69	1.26	11.54	49.40	11.69
	75,000		55.64	.057	13.15	.76	1.37	11.87	49.04	11.59

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Open Pit SE-SE 23, 57-22	Tons Non-Bess	Iron	Phos	Silica	Mang	Alum	Moist	Natural	
								Iron	Silica
Merch	2,000	54.34	.057	12.78	1.22	2.09	14.00	46.73	10.99
Wash Concentrates	<u>23,000</u>	<u>55.84</u>	<u>.057</u>	<u>13.21</u>	<u>.69</u>	<u>1.26</u>	<u>11.54</u>	<u>49.40</u>	<u>11.69</u>
	25,000	55.72	.057	13.18	.73	1.32	11.74	49.18	11.63
<u>NW-NE 26, 57-22</u>									
Wash Concentrates	6,912	55.84	.057	13.21	.69	1.26	11.54	49.40	11.69
<u>Total Sargent</u>									
Merch	55,000	54.34	.057	12.78	1.22	2.09	14.00	46.73	10.99
Wash Concentrates	<u>151,912</u>	<u>56.26</u>	<u>.067</u>	<u>10.81</u>	<u>.74</u>	<u>1.34</u>	<u>11.71</u>	<u>49.67</u>	<u>9.54</u>
	206,912	55.74	.064	11.33	.87	1.54	12.32	48.87	9.93

Note: Analysis from Tax Estimate 5-1-56
Analysis from 1956 Mine Production

d. Prospective Reserves

<u>Material</u>	<u>Tons</u>	<u>Iron</u>	<u>Moisture</u>	<u>Iron 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 ample and labor relations were good. A strike halted operations from July 1 to August 7. The settlement included a 3-year contract with wage increases spread over the three years, and provided for cost-of-living adjustments.

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b. Comparative Statement of Wages & Product

Tons	71,961
Number of Days Operated	104
Number of Shifts Operated	104
Average Daily Product	692
Average Product Per Shift	692
Production Per Man Per Day	25.9
Wages Per Hour	\$2.7860
Amount Paid for Labor	\$61,855.54
Labor Cost Per Ton	\$0.860

6. GENERAL SURFACE

a. Building & Repair None

b. Roads, Transmission Lines, Etc.

No new power lines were constructed in 1956 and none are contemplated in 1957. The M. A. Hanna Company was granted permission to build a power line across Sargent property to their Mississippi mine and Cliffs will use part of this line when a small pit is developed in the northeast corner close to the St. Paul mine. A road to this area will also be required when it is opened up.

A ditch was completed from this proposed pit around the end of the screening plant tail track and will drain into the north pit.

c. Miscellaneous General Construction None

7. OPEN PIT

a. Stripping

Under E&A No. CC-799, cleanup work was started in the south channel. This cleanup work completed E&A No. CC-799 and the remaining cleanup was charged to ore operations.

Under E&A No. CC-850, stripping on a 3-shift, 5-day-week schedule was resumed in the south channel on October 22 and continued until December 15 when crews were transferred to the Hawkins mine. The

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Bucyrus-Erie 3-1/4 yard shovel was used in stripping, with five 22-ton rear-dump Euclids on operating. This work will extend the south channel operations further east towards the old shaft. Operating conditions were good until December when snow and cold hampered operations and a series of shovel breakdowns slowed up operations.

A summary of stripping follows:

<u>E&A No.</u>	<u>Cubic Yards 1956 Stripping</u>	<u>Estimated Cost</u>	<u>Actual Cost</u>	<u>Over Under</u>
CC-799	19,822	\$0.42	\$0.763	/\$0.343
CC-850	182,518	0.492	0.471	- 0.021

b. Open Pit Mining

71,961 tons of concentrates were produced during the 1956 operating season; M. A. Hanna trespass shipments totalled 30,432 tons; making a total of 102,393 tons. Of the Hanna shipments, 2,720 tons were merch ore. To produce 71,961 tons of Sargent concentrates, 224,699 tons of crude wash ore, lean, and waste material were removed from the pit and charged to operating. Average production per shift in 1956 was 2160.6 as compared to 1946.7 in 1955. The average production of wash ore per shift was 852.2 tons in 1956 as compared to 813.5 tons in 1955.

Ore removed this year came mostly from pillars in the caves and from scrambling both the north and south banks of the south channel. Also on the west side of the pit, all ore available in the bottom was cleaned to the lean ore and also that ore under part of the approach road. The road was then backfilled with sufficient rock to stabilize it.

For each ton of concentrates produced in 1956, 3.1 tons of material were removed from the pit as compared to 2.3 tons in 1955.

c. Drainage & Pumping

Only a small amount of pumping was necessary with a portable gas-driven pump to keep the pit in operation. This water was discharged into the underground drift. Eventually, mining operations

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by the Hanna Company on the west side, which will be lower than ours at that time, should favor our pit drainage.

The St. Paul mine water on the east side gave us no problem and elevation readings were discontinued. Their pumping during the operating season lowered the water and the pump raft had to be moved to obtain enough for their mill.

8. BENEFICIATION

a. Plant Operation

Screening plant operations continued good until the latter part of the season when the head pulley drive broke. It was replaced with an Agnew mine drive which worked satisfactorily. Old boards and timber still contaminated the crude ore. Only a small amount of the oversize was crushed, with the major portion scalped off in order to keep the silica down.

At the washing plant, operations continued as before and with the same equipment. At one point delays for Great Northern service were terrible, but this was remedied before the season closed. The net crude recovery for 1956 was 81.19 per cent and the gross 76.31 per cent. In 1955 the net was 92.03 per cent and the gross 86.12 per cent. The plant operated 157 shifts (1256 hours) with a loss of 145.75 hours, or 11.6 per cent, as compared to 11.5 per cent in 1955.

The plant operated on a 2-shift, 6-day-week schedule for most of the season.

9. MAINTENANCE & REPAIRS

None

10. COST of OPERATIONS

a. Comparative Cost Statement

<u>Product</u>	<u>1956 Budget Revised 8-1-56</u>	<u>Cost Per Ton</u>	
		<u>1956</u>	<u>1955</u>
Direct Ore			8,750
Concentrates	70,000	71,961	62,025
Average Daily Output		692	813.5
Tons Per Man Per Day		25.9	28.9
Days Operated		104	149

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<u>Costs</u>	1956 Budget	Cost Per Ton	
	Revised 8-1-56	1956	1955
Pit Operating	\$0.392	\$0.413	\$0.375
Beneficiation	0.219	0.220	0.193
Miscellaneous Pit & Beneficiation	0.144	0.100	0.150
Total Pit & Beneficiation	<u>\$1.292</u>	<u>\$1.459</u>	<u>\$1.282</u>
General Mine	0.269	0.268	0.302
Winter & Idle	1.072	1.170	0.262
Cost of Production	<u>\$2.633</u>	<u>\$2.897</u>	<u>\$1.846</u>
<u>Depreciation</u>			
Plant & Equipment		0.033	0.044
Motorized Equipment & Other		0.130	0.118
Movable Equipment		0.006	
<u>Taxes</u>			
Ad Valorem		0.323	0.340
Occupational		0.076	0.252
Royalty		0.184	0.100
Total Depreciation & Taxes		0.752	0.854
Administrative Expense		0.050	0.050
Miscellaneous Expense & Income		0.036	0.022
Royalty		0.800	0.700
Total Cost on Cars		<u>\$4.536</u>	<u>\$3.472</u>

11. EXPLORATION & FUTURE EXPLORATION

No structural drilling was done in 1956; however, about \$11,000 remains in E&A No. CC-709, and it is planned to put down several shallow holes for the fee interests to determine dump room for present pit operations. One hole will be put down directly west of our present taconite dump, and the other on the old stockpile grounds of the old underground. Additional holes are also planned in the small pit development close to the St. Paul mine in the northeast corner to further develop this area and definitely establish a continuance of the ore between the present holes.

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12. TAXES

<u>Real Estate</u>	<u>1956</u>		<u>1955</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	\$79,195	\$25,325.50	\$55,258	\$16,947.16	\$23,937	\$8,378.34
Land,Bldg,Machinery	11,680	3,648.43	18,067	5,498.61	- 6,387	-1,850.18
<u>Personal Property</u>						
Equipment	6,587	2,121.88	6,294	1,956.93	293	164.95
	<u>\$97,462</u>	<u>\$31,095.81</u>	<u>\$79,619</u>	<u>\$24,402.70</u>	<u>\$17,843</u>	<u>\$6,693.11</u>
Average Mill Rate		319.06		306.49		4.10

Mineral value increased by 5 per cent raise in values per ton-a reclassification of ores from underground to open pit. Decrease in buildings and machinery by dismantling of underground headframe and underground buildings.

13. ACCIDENT & PERSONAL INJURY

Rudolph Perpich: On December 14, 1956, Perpich, a shovel oiler, slipped as he stepped off the shovel, injuring his leg and hip. Lost 9 days. Compensation paid: \$48

14. PROPOSED NEW CONSTRUCTION

None

15. EQUIPMENT RECEIVED & PROPOSED NEW EQUIPMENT

No new equipment is proposed. Wanless equipment returned was replaced with a used water sprinkler truck from the Canisteo mine and a caterpillar grader and Allis-Chalmers tractor from the Holman mine.

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SARGENT MINE
RECEIVED

WANLESS MINEANNUAL REPORTYEAR 1956

*Figures not same
as reported to
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1. GENERAL

Preparations to resume operations at the Wanless mine, closed since 1954, were begun in March, 1956, on a partnership basis with the Colorado Fuel & Iron Corporation having a two-thirds interest.

Repairs to the shovel, trucks, grader, tractors, screening plant, etc., were made during March and April. Equipment such as the shovel, churn drill, trucks, grader, tractors, etc., is being rented from The Cleveland-Cliffs Iron Company or its other operating mines.

Stripping operations continued from April 23 with one shovel on a 1-shift, 5-day-per-week schedule until the start of ore production on May 1, 1956. Although it was originally planned to have one shift working in ore and one shift working in stripping beginning May 1, it was almost the end of June before the pit was dewatered enough to permit stripping of gob and surface in the bottom of the pit. Then, because of an impending steel strike, a second crew was not hired to start stripping; the second crew was hired for the afternoon shift on August 27 on a preferential hiring basis from the Central District laidoff employee list mainly to pick up lost production occasioned by the steel strike, as well as to do some stripping. Ore production ceased on November 15, 1956, and stripping started on a 2-shift schedule which was discontinued on December 7.

A small crew was retained to repair rails on the 85-B shovel. Four trucks were transferred to the Hawkins mine and one to the Canisteo after stripping was discontinued.

2. PRODUCTION-SHIPMENTS-INVENTORIESa. Production

	<u>Direct</u>	<u>Tons</u>
Wanless		128,143
Woodbridge		<u>129,206</u>
		257,349

b. Shipments

Wanless		128,143
Woodbridge		<u>129,206</u>
		257,349

c. Stockpile Inventories

None

d. Production by Months

<u>Month</u>	<u>Direct Ore</u>		
	<u>Wanless</u>	<u>Woodbridge</u>	<u>Total</u>
May	6,699	44,298	50,997
June	2,508	50,280	52,788
August	16,274	27,556	43,830
Sept	44,907	7,072	51,979
Oct	44,431		44,431
Nov	<u>13,324</u>		<u>13,324</u>
	128,143	129,206	257,349

3. ANALYSIS

a. Tonnage & Complete Analysis of Ore Produced & Shipped

<u>Direct</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>Moisture</u>
Wanless	128,143	52.15	.115	8.56	2.03	5.08	.05	.07	.010	8.49	18.16
Woodbridge	<u>129,206</u>	<u>53.48</u>	<u>.109</u>	<u>9.49</u>	<u>.93</u>	<u>4.50</u>	<u>.08</u>	<u>.11</u>	<u>.012</u>	<u>7.76</u>	<u>18.67</u>
	257,349	52.82	.112	9.03	1.48	4.79	.07	.09	.011	8.10	18.42

4. ESTIMATE of ORE RESERVES

a. Developed Ore - Factors Used

<u>Ore</u>	<u>Cubic Feet Per Ton</u>	<u>Rock Deduction</u>	<u>Per Cent Recovery</u>
No. 1	14	0	100
No. 2	14	0	100

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<u>Wanless & Woodbridge</u>	<u>Reserve 12-31-55</u>	<u>Mined 1956</u>	<u>Balance After Mining</u>	<u>Changed by Re-estimate</u>	<u>Reserve 12-31-56</u>
Woodbridge	306,899	129,206	177,693	+ 62,473	240,166
<u>Wanless</u>					
Open Pit	1,025,728	128,143	897,585	123,644	1,021,229
Underground	<u>91,772</u>		<u>91,772</u>	49,256	<u>141,028</u>
	1,424,399	257,349	1,167,050	235,373	1,402,423

c. Estimated Analyses of Reserves

<u>Lease</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>
<u>Woodbridge</u>						
<u>SE-NE 16-58-19</u>						
Open Pit No. 1	161,433	54.37	.086	7.30	1.11	1.11
Open Pit No. 2	<u>78,733</u>	<u>50.67</u>	<u>.106</u>	<u>11.80</u>	<u>1.63</u>	<u>3.99</u>
	240,166	53.16	.093	8.78	1.28	2.05
<u>Wanless</u>						
<u>NE-SE 16-58-19</u>						
Open Pit No. 1	790,069	54.03	.115	9.22	1.43	2.93
Open Pit No. 2	231,160	48.59	.114	14.24	1.44	5.88
Underground No. 1	41,600	53.50	.151	9.52	.90	2.65
Underground No. 2	<u>99,428</u>	<u>49.05</u>	<u>.092</u>	<u>14.33</u>	<u>1.78</u>	<u>3.81</u>
	1,162,257	52.50	.114	10.67	1.44	3.58
<u>Total Mine</u>						
No. 1	993,102	54.06	.112	8.92	1.36	2.62
No. 2	<u>409,321</u>	<u>49.10</u>	<u>.107</u>	<u>13.22</u>	<u>1.56</u>	<u>5.01</u>
	1,402,423	52.61	.111	10.36	1.44	3.32
<u>Open Pit</u>						
No. 1	951,502	54.08	.112	8.85	1.40	2.93
No. 2	<u>309,893</u>	<u>48.97</u>	<u>.112</u>	<u>13.32</u>	<u>1.56</u>	<u>5.68</u>
	1,261,395	52.86	.111	10.06	1.40	3.30
<u>Underground</u>						
No. 1	41,600	53.50	.151	9.52	.90	2.65
No. 2	<u>99,428</u>	<u>49.05</u>	<u>.092</u>	<u>14.33</u>	<u>1.78</u>	<u>3.81</u>
	141,028	50.36	.109	12.91	1.52	3.47

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5. LABOR & WAGES

a. Comments

In the spring enough former Wanless employees indicated their desire to return to work so that a 1-shift, 5-day-per-week operation was started on April 23; and enough men were hired on a preferential hiring basis from the Central District to start a second shift on August 27.

Many gripes and several grievances were successfully processed during the season. Employees seemed to have a much better work attitude at the end of the season than they had at the beginning; and many labor difficulties were eliminated through a better understanding of the basic concepts of the labor contract.

A strike halted operations from July 1 to August 7. The settlement included a 3-year contract with wage increases spread over the three years, and provided for cost-of-living adjustments.

b. Comparative Statement of Production & Wages

Direct Ore - Tons	257,349
Number of Days Operated	87
Average Number of Men Working	23.25
Average Wages Per Man	\$20.63
Production Per Man Per Day	86.59
Labor Cost Per Man Per Day	\$0.238
Total Number of Man Days	2,972
Amount Paid for Labor	\$61,338.76

6. GENERAL SURFACE

a. Buildings & Repairs

The screening plant was remodeled before the beginning of the ore season to accommodate the 34-ton trucks. No major building program took place during 1956.

b. Roads

No changes in haul roads occurred during 1956.

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7. OPEN PIT

a. Stripping

Stripping was carried on from April 23 to May 1 and from August 27 to December 7. In addition, some stripping was done from May 1 to August 27 when railroad cars were not available and when the screening plant was down for repairs. Stripping and mining equipment consisted of 5 trucks, 2 tractors, 1 85-B electric shovel, 1 grader, and 1 churn drill.

E&A No. CC-800 was approved for 250,000 cubic yards of stripping; 157,999 cubic yards were moved, leaving a balance of 92,001 cubic yards to be moved under this E&A. Delays were encountered in moving the shovel from ore to stripping each day, because of a longer period required to dewater the pit, and because of a steel strike. Average yardage moved per shift totalled 1,564 cubic yards.

b. Open Pit Mining

128,143 tons of Wanless and 129,206 tons of Woodbridge ore were moved and shipped during the year for a total of 257,349 tons. This tonnage fell below the 300,000 ton estimate because of the low natural iron content of the ore. A natural iron of 43.43 per cent was set up in the agreement with Colorado Fuel & Iron; however, this percentage was impossible to meet without removing a sizeable tonnage of subgrade material as lean ore.

Ore operations began on May 1 and continued until November 15 on a 1-shift, 5-day-per-week schedule. It was apparent during the latter part of the season that if the 300,000 tons of ore were to be produced, the natural iron would drop well below a 43.00 iron natural. It was decided to mine areas in the pit that would keep the average grade above 43.00 iron natural, even though the 300,000 tons set up were not produced.

c. Pumping & Drainage

The Snyder Mining Company pumped water from the Wanless pit during the Wanless shutdown and continued pumping until May 21, 1956, at which time The Cleveland-Cliffs Iron Company took over the pumping.

A 38-inch hole was drilled into an underground drift from the bottom of the pit and a Layne-Bowler deepwell pump installed which proved much more effective in dewatering the pit than the pump-mounted raft installation. The deepwell pump will only be effective through a part of the 1957 season; and the pump-mounted raft will probably be used again in the future.

8. BENEFICIATION None

9. MAINTENANCE & REPAIRS

Preparations to resume operations at the Wanless began in March. Minor repairs were made on the shovel, trucks, tractors, grader, screening plant, etc. After stripping was discontinued in December, a repair project on the rails of the 85-B electric shovel was started.

10. COST of OPERATIONS

Comparative Mining Costs ^{DATA}

	Budget 1956	Actual	
		1956	1953
Direct Ore	300,000	257,349	249,830
Average Daily Product		2,958	2455.33
Tons Per Man Per Day		86.59	64.60
Days Operated		87	101

Costs

Total Pit Operating	\$0.391	\$0.399	\$0.531
Miscellaneous Pit & Beneficiation	0.075	0.077	0.008
Total General Mine Expense	0.155	0.202	0.166
Winter & Idle Expense			0.381
Cost of Production	<u>\$0.621</u>	<u>\$0.678</u>	<u>\$1.086</u>

Depreciation

Plant & Equipment			0.073
Motorized & Other Equipment			0.101
Equipment Loaned			0.018

Amortization - Stripping 0.281

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	Actual	
	1956	1953
<u>Taxes</u>		
Ad Valorem	\$0.059	\$0.074
Occupational	0.248	0.027
Royalty-Underlying	0.002	0.001
Total Cost on Cars	\$0.987	\$1.661

Note: Actual 1956 figures are mine cost sheet figures; not final from Cleveland.

b. Cost Comments

Total Pit Operating for 1956 is \$0.008 per ton higher than the budget and \$0.132 per ton lower than 1953 actual costs. Normally, 1956 actual costs should have been higher than 1953 actual costs because of increased labor and supply costs since 1953; however, higher production per man per day in 1956 offset most of the increases since 1953. Power Shovels-Maintenance, Trucks-Operating, Trucks-Maintenance, Pumping & Drainage—these are a few of the items showing an abnormal decrease in costs over 1953.

General Mine Expense for 1956 is \$0.047 per ton higher than the budget and \$0.036 per ton higher than 1953 actual costs, due mainly to items like Hibbing Office Expense, Insurance-Property, etc.

Do not type
(11)

11. EXPLORATION & FUTURE EXPLORATION

None anticipated.

12. TAXES

	1956		1955		Increase-Decrease	
	Assessed		Assessed		Assessed	
	Value	Taxes	Value	Taxes	Value	Taxes
<u>Real Estate</u>						
Mineral	\$234,477	\$18,929.33	\$157,014	\$13,658.65	\$77,463	\$5,270.68
Lands, Bldgs, Machinery	2,032	166.43	1,982	174.67	50	- 8.24
<u>Personal Property</u>						
Equipment	10,508	848.31	1,059	92.12	9,449	756.19
Lean Ore Stockpile	2,349	189.63	2,357	205.04	- 8	- 15.41
	\$249,366	\$20,133.70	\$162,412	\$14,130.48	\$86,954	\$6,003.22
Average Mill Rate		80.74		87.00		- 7.75

Wanless Mine
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Mineral value review by State increased reserve 239,801 tons. Re-value on present worth basis increased tax value. Blanket increase in village of 10% on all buildings. Personal property-equipment tax increased by moving in operating equipment.

13. ACCIDENTS & PERSONAL INJURY

There was only one lost-time accident at the Wanless mine in 1956. Harold Steele fractured a bone in his left hand on October 26. He was in the truck box holding switch box which was being unloaded from the truck when switch box tipped over and struck him on the back of the left hand. 22 days were lost.

14. PROPOSED NEW CONSTRUCTION

None

15. EQUIPMENT RECEIVED & PROPOSED NEW EQUIPMENT

a. Equipment Received

1	34-ton Euclid from Canisteo
1	34-ton Euclid from Holman
1	34-ton Euclid from Hawkins
2	34-ton Euclids from Hill-Trumbull
1	New 3/4-ton International Harvester Pickup Truck
1	New 1-1/2 ton International Harvester Platform Truck

b. Proposed New Equipment

None

Safety Department

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11. ACCIDENTS
AND
PERSONAL
INJURYa. Fatal Accidents

It is with the greatest of satisfaction that we can report a "No Fatality" year. Since 1898 this is the fourth time that there has been no fatal accident during a calendar year. The years are 1932, when only 630 men were employed, 1946 with 2,791 employees, 1954 with 3,946 employees and 1956 with 3,878 employees.

On two occasions we have worked approximately 23 months without a fatal injury. On one of these occasions there were 4,184 employees and on the other, 3,225 employees.

Safety Department

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Year 1956

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

TABLE I

FATAL ACCIDENT RECORD
THE CLEVELAND-CLIFFS IRON CO. AND CLIFFS POWER & LIGHT CO.
1898-1956, 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)

Safety Department

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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
1956	3878	0	0.00
1911 - 1956	135,462	237	1.75

BASED ON PER THOUSAND
EMPLOYEES

Safety Department

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

TABLE II

CLASSIFICATION OF CAUSES OF FATAL ACCIDENTS
FROM DECEMBER 1, 1898 TO DECEMBER 31, 1956

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		358

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Year 1956

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

TABLE III

CLASSIFICATION OF FATAL ACCIDENTS - 1911 TO 1956, 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,	IIIIA3, Failure To Instruct Men By Foreman And Violation IIIB3 Of Rules By Injured Man And Partner	<u>1</u>	1
II.-5,	IIIIA4, 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,	IIIIA2, Failure To Use Proper Tools Or Appliances IIIB2 Provided (By The Foreman, Injured Workman And Other Workman	<u>1</u>	1
	TOTALS		237

Safety Department

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Year 1956

11. ACCIDENTS
AND
PERSONAL
INJURY

b. All InjuriesCauses Of Compensable Injuries - Underground

Handling of material caused the greatest number of injuries underground (12) and most of these were because of failure to coordinate work and just plain carelessness.

We had eleven falls of ground injuries which is the same as in 1955. The severity of these injuries runs higher than from other classifications.

Haulage caused ten injuries which also is the same number as a year ago. Analysis of these accidents indicates improper work procedure and violations of safety rules, such as stepping on couplings while train is still in motion.

Drilling equipment caused nine injuries, most of which were caused by breakage of drill steel while drilling.

Stumbling, slipping and falling also caused nine injuries which is a reduction of four from 1955. This type of accident is hard to classify because of the conditions under which they occur. As an example, a man very seldom stumbles and falls while walking over chunk ore in the Cliffs Shaft Mine, probably because he is alert to the hazard; yet, on the other hand, on a good plank walk we have quite a number of falls which could be attributed to a feeling of confidence that comes when it seems there is no hazard.

The above accidents caused a total of 51 injuries out of a total of 99 injuries underground. The other 48 injuries were from 15 different causes.

It is the policy of the Safety Department to study all these causes and concentrate on those which occur most frequently.

The Open-Pit Properties had a very good year in accident prevention. There were 12 different causes of injury. Three were caused by slipping and falling, three from haulage, three from handling material, three from moving machinery, three from falling material, two from drilling equipment and one each from six different causes.

Accident Statistics

The "Banner Flags" awarded to the properties with the best Severity Rating as follows:

<u>Underground Property</u>	
Bunker Hill Mine	Severity Rate - 632
<u>Open-Pit Property</u>	
Hill-Trumbull Mine	Severity Rate - 154
<u>Independent Unit</u>	
Electric Power Dept.	Severity Rate - 000

The following tables cover in detail the accident statistics for individual properties and the company as a whole.

Safety Department

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Year 1956

11. ACCIDENTS
AND
PERSONAL
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

11. ACCIDENTS
AND
PERSONAL
INJURY

- CLASSIFICATION -	ACNEW	BUNKER HILL	CAMBRIA-JACKSON	CANISTEO	CLIFFS SHAFT	ELEC. POWER DEPT.	HAWKINS	HILL-TRUMBULL	HOLMAN CLIFFS	HUMBOLDT	LLOYD	MAAS	MATHER MINE, "A" SHAFT	MATHER MINE, "B" SHAFT	MISCELLANEOUS	PELLET. PLANT	OHIO	REPUBLIC	SARGENT	SPIES-VIRGIL	STISE. & SHOPS	TILDEN	WANLESS	TOTAL	
I. Trade Risk, Incidental And Non-Preventable		3			5				2	1		1	6	6								2			26
II. Negligence Of Company:																									
1. Failure To Use Safety Devices Provided																									0
2. Failure To Use Proper Tools Provided																									0
3. Violation Of Rules				2																					2
4. Improper Act Or Selec- tion Of Method Of Doing Work (By Foreman)													3												3
5. Failure To Instruct Men As To Hazards, Method, Etc.														1											1
6. Failure To Provide Safety Devices								1																	1
7. Failure To Provide Tools, Appliances Or Places To Work		1		1	1								2												5
III. Negligence Of Workmen:																									
A. Injured Workman																									
1. Failure To Use Safety Devices Provided										1															1
2. Failure To Use Proper Tools, Etc. Provided		1		1									3	2											7
3. Violation Of Rules							1	1	2					5	2	1									12
4. Improper Act Or Method Of Doing Work		7	1	2	3		3	1	1		10	8	16			1	2	1		4					60
B. Other Workman																									
1. Failure To Use Safety Devices Provided																									0
2. Failure To Use Proper Tools, Etc. Provided																									0
3. Violation Of Rules																									0
4. Improper Act Or Method Of Doing Work								1	1			1		1											4

b. All Injuries

(Continued)
TABLE IV

Safety Department
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(Continued - Next Page)

Safety Department

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Year 1956

11. ACCIDENTS
AND
PERSONAL
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>
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
1956	0	911,240 *	8,908,456 **
TOTALS	54	17,902,336	136,636,906
20 Year Average	2.70	331,525	2,530,313

* Man-Days Worked During Year Without Fatality

** Amount Of Ore Mined During Year Without Fatality

Safety Department

Annual Report

Year 1956

11. ACCIDENTS
AND
PERSONAL
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>Fatal- ities</u>	<u>TOTAL</u>
AGNEW	0	0		0
BUNKER HILL	5	16		21
CAMBRIA-JACKSON	1	3		4
CANISTEO	4	4		8
CLIFFS SHAFT	14	9		23
ELEC. POWER DEPT.	0	0		0
HAWKINS	4	3		7
HILL-TRUMBULL	1	2		3
HOLMAN CLIFFS	0	5		5
HUMBOLDT	0	3		3
LLOYD	1	2		3
MAAS	14	18		32
MATHER MINE, "A" SHAFT	15	26		41
MATHER MINE, "B" SHAFT	19	33		52
MISCELLANEOUS	1	0		1
MISCELLANEOUS - HIBBING	0	0		0
OHIO	1	1		2
PELLETIZING PLANT	2	3		5
REPUBLIC	1	3		4
RESEARCH LABORATORY	0	0		0
SARGENT (OPEN-PIT)	0	1		1
SPIES-VIRGIL	0	0		0
STHSE. & SHOPS	2	6		8
TILDEN	0	0		0
WANLESS	0	1		1
	—	—	—	—
TOTALS	85	139	0	224

Safety Department

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Year 1956

11. ACCIDENTS
AND
PERSONAL
INJURYb. All Injuries

(Continued)

TABLE VII

CAUSES OF COMPENSABLE INJURIES -- UNDERGROUND

CAUSE	ACREW	BUNKER HILL	CAMBRIA-JACKSON	CLIFFS SHAFT	LLOYD	MAAS	MATHER MINE, "A" SHAFT	MATHER MINE, "B" SHAFT	SPIES-VIRGIL	TOTAL
Fall Of Ground		2	2	1		2		4		11
Falling Chunks (Shafts, Chutes, Raises)							2	2		4
Rolling Chunks						2		2		4
Persons Falling (Shafts, Raises, Scaffolds, Etc.)							2			2
Persons Falling (Slipping & Stumbling)		2		2		1	2	2		9
Haulage		2		2		2	1	3		10
Explosives							2	1		3
Drilling Equipment		1		1		1	1	5		9
Loading Equipment							2			2
Hand Tools		1				1				2
Flying Objects		2		1		1	1	1		6
Handling Materials						3	5	4		12
Lifting Or Pulling				2		1	1	4		8
Falling Or Moving Material		3	1			2		1		7
Nails Or Sharp Objects						1				1
Electricity		2								2
Falling Down Raise						1	2	1		4
Struck By Chute Disk							1			1
Caught In Block								1		1
Moving Machinery								1		1
TOTALS		0 15	3	9	0	18	22	32	0	99

Safety Department

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Year 1956

11. ACCIDENTS
AND
PERSONAL
INJURYb. All Injuries

(Continued)

TABLE VII (Cont'd.)

OPEN PITS

CAUSE	CANI STEO	HAW- KINS	HILL- TRUM.	HOLMAN CLIFFS	HUMB OLDT	OHIO	REPU BLIC	SARG GENT	TIL DEN	WAN LESS	TOTALS
Hand Tools	1										1
Persons Falling (Slipping & Stumbling)	1					1		1			3
Dragline Operations (Swinging Material)	1										1
Drilling Equipment	1				1						2
Haulage		2	1								3
Handling Material		1			1		1				3
Moving Machinery			1		1		1				3
Falling Material				2						1	3
Fall Through Floor Opening				1							1
Heat Exhaustion				1							1
Lifting Or Pulling				1							1
Jumping From R.R. Car							1				1
TOTALS	4	3	2	5	3	1	3	1	0	1	23

Safety Department

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Year 1956

11. ACCIDENTS
AND
PERSONAL
INJURYb. All Injuries

(Continued)

TABLE VII (Cont'd.)

SURFACE (Underground Mines)

CAUSE	AGNEW	BUNKER HILL	CAMBRIA-JACKSON	CLIFFS SHAFT	LLOYD	MAAS	MATHER MINE, "A" SHAFT	MATHER MINE, "B" SHAFT	SPIES-VIRCELL	TOTAL
Handling Materials		1					2			3
Truck Haulage					1					1
Flying Object					1					1
Falling Material							1			1
Persons Falling (Slipping & Stumbling)							1			1
Hand Tools								1		1
TOTALS	0	1	0	0	2	0	4	1	0	8

OTHER OPERATIONS

CAUSE	ELEC. POWER DEPT.	SHISE., SHOPS, GARAGE	MISC.	MISC. HIBBING	PELLETIZING PLANT	TOTAL
Fall From Diamond Drill Shanty Roof		1				1
Fall From Ladder		1				1
Falling Material		2			1	3
Drilling Equipment		1				1
Fall From Platform		1				1
Moving Machinery					2	2
TOTALS	0	6	0	0	3	9

Safety Department

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Year 1956

11. ACCIDENTS
AND
PERSONAL
INJURYb. All Injuries

(Continued)

TABLE VIII

FREQUENCY RATES, ALL COMPENSABLE INJURIES

YEAR	TOTAL MAN DAYS WORKED	NUMBER OF COMPENSABLE INJURIES		FREQUENCY * RATE
		NON-FATAL	FATAL	
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 ^{1/4}	171	4	20.30
1944	993,272 ^{1/4}	121	3	15.61
1945	915,665 ^{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 ^{1/4}	145	3	15.94
1949	1,013,442	126	1	15.66
1950	1,165,301 ^{1/4}	145	5	16.09
1951	1,359,479 ^{3/4}	136	2	12.69
1952	1,197,416 ^{1/4}	152	5	15.87
1953	1,234,755 ^{1/4}	152	2	15.39
1954	884,848	99	0	13.99
1955	895,762	121	4	17.44
1956	911,240 ^{1/4}	139	0	19.07

* Based on One Million Man-Hours Of Labor.

TABLE VIII-A

SEVERITY RATES, ALL COMPENSABLE INJURIES

YEAR	NON-FATAL		FATAL DAYS LOST	DAYS LOST ALL INJURIES	SEVERITY * RATE
	DAYS LOST	RATE			
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
1956	5,560	.763	0	5,560	.763

* Based on Days Lost By Injuries Per 1,000 Man-Hours Of Labor
except for Years 1955 and 1956 which are based on new rate -
1,000,000 Man-Hours Of Labor

Safety Department

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Year 1956

11. ACCIDENTS
AND
PERSONAL
INJURYb. All Injuries

(Continued)

TABLE IX

COMPARISON OF COMPENSABLE ACCIDENTS, INCLUDING FATALITIES
(BY MINES)

<u>Mine Or Plant</u>	<u>FREQUENCY</u>		<u>SEVERITY</u>	
	<u>1955</u>	<u>1956</u>	<u>1955</u>	<u>1956</u>
AGNEW	14.64	0.00	915	0
BUNKER HILL	33.57	23.08	1,122	614
CAMBRIA-JACKSON	3.45	10.83	345	1,318
CANISTEO	14.40	15.38	554	435
CLIFFS SHAFT	26.33	13.17	4,233	661
ELEC. POWER DEPT.	0.00	0.00	0	0
GENERAL ROLL	0.00	0.00	0	0
HAWKINS	0.00	9.66	0	258
HILL-TRUMBULL	7.39	7.53	151	147
HOLMAN CLIFFS	15.60	16.97	831	316
HUMBOLDT	16.87	21.86	337	780
LLOYD	10.62	160.80	621	14,472
MAAS	16.27	38.03	919	1,694
MATHER MINE, "A" SHAFT	22.32	23.06	12,352	845
MATHER MINE, "B" SHAFT	24.80	26.07	6,783	1,156
MISCELLANEOUS	0.00	0.00	0	0
MISCELLANEOUS - HIBBING	24.16	0.00	459	0
OHIO	0.00	15.85	0	396
PELLETIZING PLANT	-	48.52	-	954
REPUBLIC	0.00	18.60	0	211
SARGENT (OPEN-PIT)	62.77	25.64	189,517	308
SPIES-VIRGIL	0.00	0.00	0	0
STHSE. & SHOPS	9.61	16.95	670	944
TILDEN	71.03	0.00	852	0
WANLESS	-	25.60	-	563
	-----	-----	-----	-----
All Properties	17.44	19.07	4,381	763

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

TABLE X
COMPENSABLE INJURIES INCLUDING FATALITIES

Mine Or Plant	Tons Of Ore Produced	Hours Of Labor	No. Of Fatalities	No. Of Comp. Inj.	Days Lost, Fatalities	Compensable Days Lost	Total Days Lost - Fatalities & Compens.	Frequency	Severity
AGNEW *	26,700	26,475						0.00	0
BUNKER HILL	438,678	693,283		16		426	426	23.08	614
CAMBRIA-JACKSON	218,000	276,929		3		365	365	10.83	1,318
CLIFFS SHAFT	643,089	683,468		9		452	452	13.17	661
LLOYD **	27,351	12,438		2		180	180	160.80	14,472
MAAS	394,329	473,370		18		802	802	38.03	1,694
MATHER MINE, "A" SHAFT	1,252,192	1,127,568		26		953	953	23.06	845
MATHER MINE, "B" SHAFT	1,288,044	1,266,059		33		1,464	1,464	26.07	1,156
SPIES-VIRGIL ***	9,161							0.00	0
TOTALS	4,297,544	4,559,590		107		4,642	4,642	23.47	1,018
CANISTEO	1,019,117	259,994		4		113	113	15.38	435
HAWKINS ****	898,447	310,484		3		80	80	9.66	258
HILL-TRUMBULL	638,209	265,632		2		39	39	7.53	147
HOLMAN CLIFFS	993,012	294,628		5		93	93	16.97	316
HUMBOLDT	206,901	137,216		3		107	107	21.86	780
OHIO	122,401	63,072		1		25	25	15.85	396
REPUBLIC	217,166	161,294		3		34	34	18.60	211
SARGENT (OPEN-PIT)	71,961	38,998		1		12	12	25.64	308
TILDEN	186,349	22,341		0		0	0	0.00	0
WANLESS	257,349	39,060		1		22	22	25.60	563
TOTALS	4,610,912	1,592,719		23		525	525	14.44	330
ELEC. POWER DEPT.		72,198						0.00	0
GENERAL ROLL		549,000						0.00	0
MISCELLANEOUS		55,022						0.00	0
MISCELLANEOUS - HIBBING		45,618						0.00	0
PELLETIZING PLANT		61,828		3		59	59	48.52	954
STHSE. & SHOPS		353,947		6		334	334	16.95	944
TOTALS		1,137,613		9		393	393	7.91	345
GRAND TOTALS	8,908,456	7,289,922		139		5,560	5,560	19.07	763

* AGNEW production includes 5,051 tons from the Alworth.
 ** LLOYD production from stock.
 *** SPIES-VIRGIL production from stock.
 **** HAWKINS production includes 50,489 tons from I.H. Co. fine ore pile.

b. All Injuries

(Continued)

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THE CLEVELAND-CLIFFS IRON COMPANY
SAFETY DEPARTMENT, ACCIDENT STATISTICS, JANUARY 1ST - DECEMBER 31ST, 1956

Line Or Plant	Position Rating	Hours Of Labor	No. Of Fatalities	Compensable Injuries	Non-Comp., 1 - 7 Days	Compensable Days Lost	Days Lost, Non-Comp., 1 - 7 Days	Lost-Time Injuries Including Fatalities	Days Lost, All Injuries & Fatalities	Frequency	Severity	Avg. Days Lost Per Injury	Type Of Operation
AGNEW		26,475								0.00	0	0	Underground
BUNKER HILL	1	693,283	16	5	426	12	21	438	30.29	632	21		
CLIFFS SHAFT	2	683,468	9	14	452	39	23	491	33.65	718	21		
NATHER MINE, "A" SHAFT	3	1,127,568	26	15	953	49	41	1,002	36.36	889	24		
NATHER MINE, "B" SHAFT	4	1,266,059	33	19	1,464	55	52	1,519	41.07	1,200	29		
CATERIA-JACKSON	5	276,929	3	1	365	3	4	368	14.44	1,329	92		
MAAS	6	473,370	18	14	802	45	32	847	67.60	1,789	25		
LLOYD	7	12,438	2	1	180	3	3	183	241.20	14,713	61		
TOTALS		4,559,590	107	69	4,642	206	176	4,848	38.60	1,063	28		
TILDEN	1	22,341							0.00	0	0	Open-Pit	
HILL-TRUMPULL	2	265,632	2	1	39	2	3	41	11.29	154	14		
REPUBLIC	3	161,294	3	1	34	5	4	39	24.80	242	10		
HAWKINS	4	310,484	3	4	80	8	7	88	22.55	283	13		
SARGENT	5	38,998	1		12		1	12	25.64	308	12		
HOLMAN CLIFFS	6	294,628	5		93		5	93	16.97	316	19		
OHIO	7	63,072	1	1	25	2	2	27	31.71	428	13		
CANISTEO	8	259,994	4	4	113	13	8	126	30.77	485	16		
WANLESS	9	39,060	1		22		1	22	25.60	563	22		
HULBOLDT	10	137,216	3		107		3	107	21.86	780	36		
TOTALS		1,592,719	23	11	525	30	34	555	21.35	348	16		
GENERAL ROLL	1	549,000							0.00	0	0	Independent Unit	
ELEC. POWER DEPT.	2	72,198							0.00	0	0		
MISCELLANEOUS-HIBBING	3	45,618							0.00	0	0		
MISCELLANEOUS	4	55,022		1		2	1	2	18.17	36	2		
STHSE. & SHOPS	5	353,947	6	2	334	4	8	338	22.60	955	42		
PELLETIZING PLANT	6	61,828	3	2	59	8	5	67	80.87	1,084	13		
TOTALS		1,137,613	9	5	393	14	14	407	12.31	358	29		
GRAND TOTALS		7,289,922	139	85	5,560	250	224	5,810	30.73	797	26		

FREQUENCY = $\frac{\text{NO. OF LOST TIME .CC. X 1,000,000}}{\text{M.N. HOURS WORKED}}$

SEVERITY = $\frac{\text{NO. OF DAYS LOST X 1,000,000}}{\text{M.N. HOURS WORKED}}$

THE CLEVELAND-CLIFFS IRON COMPANY
SAFETY DEPARTMENT, ACCIDENT STATISTICS, JANUARY 1ST - DECEMBER 31ST, 1956

MICHIGAN: Mine Or Plant	Position Rating	Hours Of Labor	No. Of Fatalities	Compensable Injuries	Non-Comp., 1 - 7 Days	Compensable Days Lost	Days Lost, Non-Comp., 1 - 7 Days	Lost-Time Injuries Including Fatalities	Days Lost, All Injuries & Fatalities	Frequency	Severity	Avg. Days Lost Per Injury
GENERAL ROLL	1	437,030								0.00	0	0
ELEC. POWER DEPT.	2	72,198								0.00	0	0
TILDEN	3	22,341								0.00	0	0
MISCELLANEOUS	4	55,022			1		2	1	2	18.17	36	2
REPUBLIC	5	161,294		3	1	34	5	4	39	24.80	242	10
OHIO	6	63,072		1	1	25	2	2	27	31.71	428	13
BUNKER HILL	7	693,283		16	5	426	12	21	438	30.29	632	21
CLIFFS SHAFT	8	683,460		9	14	452	39	23	491	33.65	718	21
HUMBOLDT	9	137,216		3		107		3	107	21.86	780	36
MATHER MINE, "A" SHAFT	10	1,127,568		26	15	953	49	41	1,002	36.36	839	24
STHSE. & SHOPS	11	353,947		6	2	334	4	8	338	22.60	955	42
PELLETIZING PLANT	12	61,828		3	2	59	8	5	67	80.87	1,084	13
MATHER MINE, "B" SHAFT	13	1,266,059		33	19	1,464	55	52	1,519	41.07	1,200	29
CAMBRIA-JACKSON	14	276,929		3	1	365	3	4	368	14.44	1,329	92
MAAS	15	473,370		18	14	802	45	32	847	67.60	1,789	26
LLOYD	16	12,438		2	1	180	3	3	183	24.20	14,713	61
TOTALS - MICHIGAN		5,897,063		123	76	5,201	227	199	5,428	33.75	920	27
MINNESOTA:												
GENERAL ROLL	1	111,970								0.00	0	0
MISCELLANEOUS-HIBBING	2	45,618								0.00	0	0
AGNEW	3	26,475								0.00	0	0
HILL-TRULBULL	4	265,632		2	1	39	2	3	41	11.29	154	14
HANKINS	5	310,484		3	4	80	8	7	88	22.55	283	13
SURGENT	6	38,998		1		12		1	12	25.64	308	12
HOLMEN CLIFFS	7	294,628		5		93		5	93	16.97	316	19
CANISTEO	8	259,994		4	4	113	13	8	126	30.77	485	16
WANLESS	9	39,060		1		22		1	22	25.60	563	22
TOTALS - MINNESOTA		1,392,859		16	9	359	23	25	382	17.95	274	15
GRAND TOTALS		7,289,922		139	85	5,560	250	224	5,810	30.73	797	26

FREQUENCY = $\frac{\text{NO. OF LOST TIME ACC. X 1,000,000}}{\text{M.M. HOURS WORKED}}$

SEVERITY = $\frac{\text{NO. OF DAYS LOST X 1,000,000}}{\text{M.M. HOURS WORKED}}$

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11. ACCIDENTS
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INJURYb. All Injuries

(Continued)

TABLE XII

SHOWING TIME PERIODS WHEN
COMPENSABLE INJURIES OCCURRED

<u>TIME</u>	<u>NUMBER</u>	<u>WORKING PERIOD</u>
8:00 A.M. TO 12:00 NOON _____	45 _____	FIRST HALF OF DAY SHIFT
12:00 NOON TO 4:00 P.M. _____	34 _____	SECOND HALF OF DAY SHIFT
4:00 P.M. TO 8:00 P.M. _____	16 _____	FIRST HALF OF AFTERNOON SHIFT
8:00 P.M. TO 12:00 MIDNIGHT _	27 _____	SECOND HALF OF AFTERNOON SHIFT
12:00 MIDNIGHT TO 4:00 A.M. _	6 _____	FIRST HALF OF NIGHT SHIFT
4:00 A.M. TO 8:00 A.M. _____	11 _____	SECOND HALF OF NIGHT SHIFT
TOTAL _____	139	

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INJURYb. All Injuries

(Continued)

TABLE XIII

SHOWING OCCUPATION OF INJURED WORKERS
(COMPENSABLE INJURIES)

<u>UNDERGROUND</u>		<u>SURFACE</u>		<u>OPEN-PIT</u>	
Miner _____	50	Laborer _____	1	Carpenter _____	1
Timberman _____	4	Truck Driver _____	2	Wash Plant Foreman _____	1
Motorman _____	5	Tractor Operator _____	1	Surface Laborer _____	1
Scraperman _____	6	Blacksmith _____	1	Drill Helper _____	1
Cage Rider _____	2	Miner _____	1	Truck Driver _____	3
Skip Tender _____	2	Skip Pit Attendant _____	1	Repair Helper _____	3
Shift Boss _____	2	Welder _____	1	Cyclone Operator _____	1
Trackman's Helper _____	1			Welder - Starter _____	1
Motor Brakeman _____	4			Welder _____	2
Stope Scraperman _____	8			Electrician _____	1
Underground Repairman _____	4			Blaster _____	1
Laborer _____	1			Tractor Operator _____	1
Winze Cage Attendant _____	1			Mill Oiler _____	1
Trackman _____	1			Miner's Helper _____	1
Diamond Drill Helper _____	1			Shift Supervisor _____	1
Shaft Repairman _____	1			Pocketman _____	1
Foreman _____	2			Shovel Oiler _____	1
Timber Hoister _____	2			Sampler & Car Dropper _____	1
Welder _____	1				
Car Repairman _____	1				
TOTALS	99		8		23

TABLE XIII-A

GENERAL STOREHOUSE

Drill Runner _____	4
Dia. Drill Helper _____	2
	<u>6</u>

PELLETIZING PLANT

Ball Disc Operator _____	1
Ball Mill Pulverizer Helper _____	1
Shift Leader _____	1
	<u>3</u>

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11. ACCIDENTS
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INJURYc. Safety Inspection

Safety inspections of all properties are made as often as possible by members of the department. The four large underground mines require from four to seven days for an inspection which covers all of the underground and surface. All other properties require from one to three days for a complete inspection. The Mather "A", Mather "B", Cliffs Shaft and Bunker Hill Mines each have a Safety Foreman who spends most of his time on safety inspection and these men certainly help with our safety program.

All inspections by members of the Safety Department are made in company of a mine supervisor and a "Labor Union" representative, if one is available. A written report is made out for each inspection, including orders issued by the supervisor, and a report by the union safety committeeman if he makes one out. These reports are discussed with the mine Captain and/or Superintendent so as to put into effect any recommendations. Copies of all reports are sent to all concerned. Should there be any exception to the recommendations it is brought before the Central Safety Committee or management for judgment.

Cooperation of all supervisory personnel has been very good.

Safety Department

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11. ACCIDENTS
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INJURYc. Safety Inspection (Continued)Idle Property

Idle property was inspected during the early spring and late fall seasons. Recommendations were sent to the various properties which call for repairs and to Mr. Peter DeRoche.

Damage to our fences during the year was not as great as in previous years. New fencing and shaft and test-pit filling was completed in a number of places. The largest job was at the Lloyd Mine where rails were placed across the shaft at ledge and the shaft was filled to surface. A number of other shafts and pits were filled at the Lloyd property and new fencing was installed around the old caves. Only a small amount of work will be required at the Lloyd property in 1957.

A small shaft was filled south of Negaunee on the old Cascade Road. This shaft had been covered at some time in the distant past and had broken through.

Very few test-pits or shafts remain to be filled or covered and those known will be taken care of during the summer of 1957.

Some subsidence of old shafts has occurred at the Michigamme Mine and filled again before the end of the year, but some new subsidence has again occurred and will be taken care of soon. This one shaft is fenced for protection to the public.

Safety Department

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11. ACCIDENTS
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INJURYc. Safety Inspection (Continued)Fire Patrol & Inspections

Fire patrols are in effect at all underground properties as per our rules. This rule has probably saved us much trouble from serious fires. As all incendiary fires are not reported to this office we are unable to furnish any data of any value on small fires which did not involve loss of property. The insurance department, I believe, furnish all this data. A report on fires which occurred at Mesaba Range Mines follows:

FIRES - MESABA RANGE - 1956

AGNEW MINE

January 6, 1956

Cause:
Damage:

6' x 6' x 7' high shack constructed of shiplap and covered with tar paper. It was last used as a sample shack in the Hull Rust yards.
Undetermined origin
Completely destroyed - Was built in 1954 at cost of \$95.00.

HOLMAN CLIFFS MINE

April 11, 1956

Cause:
Damage:
Extinguishers
Used:

Turnadozer
Turnadozer was hit by five empty runaway ore cars and then caught fire.
Complete loss of Turnadozer.
Pyrene & Dugas - Taconite Fire Dept. also called.

HAWKINS MINE

May 19, 1956

Cause:
Damage:

Work clothes - 3 jackets and pair of overalls.
Sparks from acetylene torch ignited clothes.
Total loss.
Fire put out by water.

AGNEW MINE

June 23, 1956

Cause:
Damage:

Chips, Bark & Pile of Ties in timber yard.
Unknown.
Burned chips, bark and ties. No serious damage.
Hibbing Fire Department called.

CANISTEO MINE

November 23, 1956

Cause:
Damage:
Extinguisher
Used:

Small pile of hay.
Welder was burning a plate on first floor of plant.
Sparks fell through cracks of floor onto some hay below used for covering concrete.
Small pile of hay burned.
Ansul.

(Cont'd.)

Safety Department

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11. ACCIDENTS
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INJURYc. Safety Inspection (Continued)Fire Patrol & Inspections (Cont'd.)

The most serious fire which occurred on the Marquette Range was at the Mather Mine, "B" Shaft. A crew cutting steel ground support with a torch started the fire. The crew claimed they followed rules by wetting down before and after cutting but some metal slag must have got behind the blocking to start the fire. The supervisory crews did a good job of extinguishing the fire but because it was hidden in timber pillars it was hard to get at. Reports of this fire were submitted.

Most of the fire patrol work on surface was done by the police and watchmen at the various properties.

During the summer, through the help of the Negaunee Fire Department, tests were made on hydrants at the various properties. Some recommendations were made on position or facing of a couple hydrants for the purpose of using the booster pumper on the fire truck.

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INJURYc. Safety Inspection (Continued)

TABLE XIV

1956

Mine Or Plant	Violations Of Standards	Safety Suggestions	Recommendations	Fire Hazard	Total
BUNKER HILL	25	35	11	1	72
CAMBRIA-JACKSON	0	5	2	0	7
CLIFFS SHAFT	12	53	16	20	101
DIAMOND DRILLS		1	3	1	5
HUMBOLDT	6	13	5	5	29
MAAS	9	36	7	0	52
MATHER MINE, "A" SHAFT	12	36	9	1	58
MATHER MINE, "B" SHAFT	13	41	16	3	73
OHIO	8	5	3	1	17
PELLETIZING PLANT	6	6	5	0	17
PRIVATE DWELLINGS				3	3
REPUBLIC	1	26	10	7	44
STHSE. & SHOPS	0	0	0	0	0
TILDEN	3	1	2	0	6
TOTALS	95	258	89	42	484

TABLE XV

1955

Mine Or Plant	Violations Of Standards	Safety Suggestions	Recommendations	Fire Hazard	Total
BUNKER HILL	51	69	44	1	165
CAMBRIA-JACKSON	7	9	12	3	31
CLIFFS SHAFT	13	87	28	12	140
HUMBOLDT	2	31	18	9	60
LLOYD	4	15	8	0	27
MAAS	25	70	25	3	123
MATHER MINE, "A" SHAFT	13	60	29	9	111
MATHER MINE, "B" SHAFT	13	51	33	7	104
OHIO	2	7	6	2	17
REPUBLIC	1	12	6	6	25
SPIES-VIRGIL	0	0	1	0	1
STHSE. & SHOPS	1	11	11	2	25
TILDEN	1	5	4	4	14
TOTALS	133	427	225	58	843

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11. ACCIDENTS
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INJURYc. Safety Inspection (Continued)Blasting Inspections

A total of 796 blasting inspections were made by supervisors in underground mines with a total of 83 violations of safe practices reported, of which, most were failure to use stemming.

During the year we have put on trial a new blank form on electric blasting inspection to coincide with the new safety rules which are now being printed. These blank forms, along with the old ones, should keep all supervisors even more alert than they are today.

Because of the blasting accidents which occurred during 1955 we concentrated much of our inspection along this line. At the present time, we do more electric blasting than ever before and at some mines it covers close to 90% of all blasting. We know electric blasting can be safer than any other method but like everything else, it must be done right.

At the open-pits, most of the blasting is done under supervision of a foreman and in some cases with the manufacturer's representative present so we do not expect too much trouble. In comparison, at the underground mines, the greater part of the loading and hook-ups is done by the miners in the contract so they must be trained and checked by the supervisors.

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11. ACCIDENTS
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INJURYc. Safety Inspection (Continued)

TABLE XVI

NUMBER OF INSPECTIONS MADE DURING THE BLASTING
PROCEDURE IN VARIOUS MINING CONTRACTS

<u>MINE</u>	<u>NO. OF INSPECTIONS</u>	<u>NO. OF VIOLATIONS REPORTED</u>
BUNKER HILL MINE	5	1
CAMBRIA-JACKSON MINE	75	47
CLIFFS SHAFT MINE	194	15
MAAS MINE	2	0
MATHER MINE, "A" SHAFT	235	4
MATHER MINE, "B" SHAFT	285	16
	—	—
TOTALS	796	83

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11. ACCIDENTS
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INJURYc. Safety Inspection (Continued)Safety Rules & Regulations

There were only 147 new safety rule books given to employees during the year.

The new safety rules for underground employees were turned over to the Legal Department after the Central Safety Committee had approved them. The rules were then revised again by a committee to bring them up to date. At the end of the year the rule book was ready for proof-reading. When printed, early in 1957, all underground employees will be given copies.

Safety Department

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11. ACCIDENTS
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INJURYc. Safety Inspection (Continued)

TABLE XVII

RULE BOOKS DISTRIBUTED AT MICHIGAN MINES AND PLANTS

<u>Mine Or Plant</u>	<u>SURFACE</u>	<u>UNDERGROUND</u>	<u>OPEN-PITS & CONCENTRATING PLANTS</u>	<u>TOTAL</u>
BUNKER HILL MINE	1	1	0	2
CAMBRIA--JACKSON MINE	2	0	0	2
CLIFFS SHAFT MINE	1	1	0	2
CLIFFS SHAFT LABORATORY	0	0	0	0
ELECTRIC POWER DEPT.	0	0	0	0
ENGR. & GEOL. DEPTS.	0	0	0	0
HUMBOLDT MINE	0	0	26	26
MAAS MINE	0	1	0	1
MATHER MINE, "A" SHAFT	0	1	0	1
MATHER MINE, "B" SHAFT	2	4	0	6
MISCELLANEOUS	0	0	0	0
OHIO MINE	0	0	3	3
PELLETIZING PLANT	0	0	46	46
REPUBLIC MINE	0	0	57	57
STHSE. & SHOPS	0	0	0	0
TILDEN	0	0	1	1
TOTALS	6	8	133	147

Safety Department

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11. ACCIDENTS
AND
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INJURYc. Safety Inspection (Continued)Central Safety Committee

The committee met once each month during the year to classify accidents and discuss means of prevention. Also, any new problems were discussed and when necessary, committees appointed to work out the many problems in connection with safe practices and policies.

Reports of the proceedings of all meetings were made up and distributed to all members by the Safety Department.

Supervisors Safety Meetings

The meetings are also held once each month at which time details of all accidents are discussed. Ideas are exchanged and various hazards brought up for discussion. Proposed safety rules were also given a "going over", for these are the men who must enforce them.

Lake Superior Mines Safety Exchange

This is a part of the Lake Superior Mines Safety Council and is used to exchange accident statistics, ideas and to ask for help on new problems through questionnaires. Fourteen of the twenty-seven companies in the Lake Superior Mines Safety Council belong to the Exchange.

Lake Superior Mines Safety Council

This council is generally considered the best mine safety organization in the country. With the exception of a couple of small companies in Minnesota, all other iron and copper mining companies are members and take an active part. Monthly meetings are held during the year on the various mining ranges with the greater attendance being from that particular range. In each case, a local safety man is Chairman and his committee is composed of safety men from the local operating companies. Attendance at these meetings ranges from about 70 to 145 mining men. Meetings are usually held at Ishpeming, Michigan - Ely, Hibbing, Virginia, Grand Rapids & Ironton, Minnesota - Caspian, Ironwood & Houghton, Michigan. The annual meeting is held at Duluth, Minnesota, usually in the month of May, with attendance at about 800. Speakers for this meeting are brought from all parts of the United States and Canada. Our company has been represented on the speakers' platform many times. Also, members of our Safety Department have assisted in its organization and promotion since April, 1919 and have continuously served as Chairmen, on committees and as President.

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Our company is a charter member of the council. The council certainly has been a source of much information along all lines of safety and the mining section is well organized with experienced personnel. Our company again has taken a very active part in this organization and has served in various capacities up to General Chairman of the Mining Section. I believe our dues have been well spent in the Council.

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INJURYc. Safety Inspection (Continued)Inspection Reports From Mines & Plants

The following inspection reports are made by Mine or Department supervisors or employees appointed by the Superintendent and are checked by the Safety Department:

HOISTING ROPES (Daily)
SKIP & CAGE ROADS (Twice a Week)
SAFETY CATCHES ON CAGES (Monthly)
LADDER ROADS (Weekly)
SLACK ROPE ALARM (Monthly)
HOISTING ENGINES (Monthly)
FIRE EXTINGUISHERS (Twice a Year)
FIRE EQUIPMENT (Four times a Year)
FIRE PREVENTION (Once a Year)
BLASTING INSPECTION (Six times a Year -
Each Contract)
OLD STOPE INSPECTION (Cliffs Shaft Mine)
FIRE PATROL INSPECTION (Idle periods)

Following are tables showing the kind and number of safety inspection reports made by the mine and plant foremen, which were received and checked by this department:

TABLE XVIII

Type Of Inspection	Ag-new	Bunk Hill	Camb. Jack.	Cliffs Shaft	Lloyd	Maas	Math er-A	Math er-B	Athens	Total
HOISTING ROPES	4	193	216	219		256	215	223		1,326
SKIP & CAGE ROADS	4	29	130	16		3	36	45	1	264
LADDER ROADS	4	27	10			3	36	44		124
CAGE SAFETY CATCHES	1	5	7	3		4	8	12		40
SLACK ROPE ALARM			7	3		5	7	11		33
HOIST INSPECTION		24	12	48	3	36	24	24		171
FIRE EXTINGUISHER	1	1	2	1		1	2	2		10
FIRE EQUIPMENT	2		1			3				6
FIRE PREVENTION	1			14			13	9		37
C.O. ALARM						2				2
HOIST ENGINEERS' SPECIAL REPORT	21									21
SKIP, CAGE & LADDER				25						25
TOTALS	38	279	385	329	3	313	341	370	1	2,059

Mine Or Plant	Fire Extinguishers	Fire Prevention	Fire Equipment	Total
CANISTEO	2	16	2	20
DIAMOND DRILLS				0
ELEC. POWER DEPT.	8	8		16
GENERAL OFFICE		2		2
HAWKINS	2	38	2	42
HIBBING OFFICE	2	1		3
HILL-TRUMBULL	2	17	2	21
HOLMAN CLIFFS	2	22	2	26
HUMBOLDT	2			2
MATHER INN				0
OHIO	1	4		5
PELLETIZING PLANT				0
RENTED BUILDINGS				0
REPUBLIC	2	4		6
RESEARCH LABORATORY	2	1		3
SARGENT (OPEN-PIT)	2	3	2	7
STHSE, SHOPS & GARAGE		5		5
TILDEN				0
WANLESS	1	8	1	10
TOTALS	28	129	11	168

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TABLE XIX

TYPES AND TOTALS OF FIRE EXTINGUISHERS INSTALLED AT VARIOUS PROPERTIES

Mine Or Plant	2½ - 3 Gal. Soda - Acid	1 - 5 Gal. Non-Freeze	2½ - Gal. Foam Type	4 lb. Dry Powder	10 - 15 lb. Dry Powder	20 - 30 lb. Dry Powder	1 - 1½ Qt. Vaporizing	1 - 3½ Gal. Vaporizing Automatic	Carb. Diox. 5, 10, 15, 30 lb.	Carb. Diox. 150 lb. Dry Powder & Nitrogen Expanses	TOTAL	
AGNEW MINE	1					10	2	2			15	
BUNKER HILL MINE	11	8		8	8	26	17				78	
CAMBRIA-JACKSON MINE	19	4		2		25	4	4			58	
CANISTEO MINE	5		1		8	14	50	2			80	
CLIFFS SHAFT MINE	12	3		8		26	6	1			56	
DIAMOND DRILLS		3		12		9					24	
GEN. STHSE. & SHOPS	19	22	1	42		16	3				103	
HAWKINS MINE	8	2		1	2	17	35	8			73	
HILL-TRUMBULL MINE	5			2	16	16	33	3			75	
HOLMAN CLIFFS MINE	11			2	6	22	48	2			91	
HUMBOLDT MINE	1	11				38	7				57	
LLOYD MINE	7	2	1		4	5	18	4			41	
MAAS MINE	4	3	2		4	16	6				35	
MATHER INN	14	1		8		1	1				25	
MATHER MINE, "A" SHAFT	9	13		20	2	74					118	
MATHER MINE, "B" SHAFT	32	7		1	1	75					116	
OHIO MINE	6	2		2		12	22				44	
PELLETIZING PLANT		5				9				2	16	
REPUBLIC MINE	2	13				64				2	81	
SARGENT (OPEN-PIT) MINE		1			1	4	5	2		1	14	
SPIES-VIRGIL	3	4			1	3	1	3			15	
TILDEN		5			3	3	29	1			41	
WANLESS	3					9	2	1			15	
McCLURE PLANT (ELEC. POWER DEPT.)						2	3	2			7	
CARP PLANT " " "						2	4	1		1	8	
HOIST PLANT " " "						2	2	2			6	
REPUBLIC PLANT " " "						1	1	1		1	4	
ESCANABA PLANT " " "						1	1	1		1	4	
AUTRAIN PLANT " " "						1	1	2		1	5	
DIESEL PLANT " " "			5				3			1	9	
STEAM PLANT " " "							2		5	12	19	
HIBBING OFFICE	4		1				3	1			9	
ISHPEMING GEN. OFFICE	7	3	1			2					13	
RENTED HOUSES	4	5		12	1	1	1				24	
RESEARCH LABORATORY	4					10					14	
TOTALS	191	117	12	120	57	516	310	43	5	16	6	1,393

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TABLE XX

CAUSES AND NUMBER OF DISCIPLINARY ACTIONS

Mine Or Plant	Reporting To Work Under The Influence Of Liquor	Smoking Underground	Smoking In The Headframe Or "Timber Tunnel"	Losing Too Much Time	Insubordination	Cutting two 60" fuse to 32" when "Block-holing"	Cursing And Threatening Harm To The Mining Captain	Careless Use Of "Euclid" Truck	Careless Use Of Diamond Bits	Removing Dirt Before Covering Back Of Drift	Sleeping On The Job	Careless Use Of "Primacord"	Hoisting Powder Bag Up Raise Without Using The Powder Skip	Failed To Sample 4 Skips Of Ore	Not Wearing Glasses When Using Torch	Going Underground Without Brass Check	Failure To Guard Entrances To Blasting Area	Three Men Riding On Motor At Same Time	Running Motor Through Air Doors	Violation Of Safety Rule	Miscellaneous	TOT.
BUNKER HILL MINE	3	4		1																		8
GAMBRIA-JACKSON MINE					2																	2
CANISTEO MINE	2			4	1																	7
CLIFFS SHAFT MINE	3	1	1	5	1	1	1	1														14
DIAMOND DRILL DEPT.				1				1														2
GENERAL SHOPS	1																					1
GENERAL STOREHOUSE				1																		1
HAWKINS MINE	1							1														2
HILL-TRUMBULL MINE	1			3																		4
HOLMAN CLIFFS MINE	1			1																		2
HUMBOLDT MINE				3																	1	4
MAAS MINE	1			2																		3
MATHER MINE, "A" SHAFT		1	1	17	2				2	4	1	1	1									30
MATHER MINE, "B" SHAFT	2	3	1	6						15					1	1	2	3	1	2		37
OHIO MINE																						0
REPUBLIC MINE																						0
SARGENT (OPEN-PIT) MINE								1														1
TILDEN MINE																						0
WHEELER MINE	1			1																		2
TOTALS	16	9	3	47	4	1	1	3	1	2	19	1	1	1	1	1	2	3	1	2	1	120

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The large underground mines which we are operating require constant checking of air circuits in order to ventilate properly all sections of the mine. In order to increase efficiency of the employee, he must have air which is about normal and a sufficient quantity to take away any blasting fumes or other gases. Recommended number of cubic feet of air per minute is 500 for each employee in the mine on the largest shift. We are well within this requirement and furnish considerably more air in all rock development.

All mines are equipped with large main mine fans with booster and auxiliary fans where needed.

Briefly, the air intake to each underground mine with the number of cubic feet per minute per man on the largest shift follows:

<u>Mine</u>	<u>Intake - C.F.M.</u>	<u>Per Man - C.F.M.</u>
CAMBRIA-JACKSON	55,000	1,100
CLIFFS SHAFT	151,000	604
BUNKER HILL - MAAS	125,000	541
MATHER MINE, "A" SHAFT	147,000	668
MATHER MINE, "B" SHAFT	144,000	595

Besides making ventilation surveys of all underground properties, all subsidence drill holes were checked for air movement and reports submitted.

Dust Sampling and Analysis

Every attempt was made to take dust samples as often as possible to keep check on conditions in the mines but because of lack of personnel the number taken was limited.

Many test samples were taken at the Humboldt and Republic Plants while the dust collection or allaying systems were being installed. These samples are not recorded in the annual report because they would not be representative of present conditions. Test samples were also taken in the Cliffs Shaft Mine, 15th Level Crushing Plant. Since installation of the new dust collector these samples are favorable. At the skiptender's location the dust counts were high because the collector was not yet installed. This will be taken care of soon. Also, a closed-in section is being built for the skiptender which will give him protection at all times.

At the Pelletizing Plant, which started to operate during the year, the dust problem was serious. This condition we hope will be taken care of during 1957 when operating conditions will be much better.

Our standard method of ventilating rock headings is still about the same as in the past and has been very satisfactory. This method is: use of a #45 Sturtevant fan drawing air from the heading through 14" or 16" spiral-weld metal tubing, the volume being considerably more than that of another fan which is sweeping the breast. In this way, there is no contamination of air with dust or smoke in the full length of the drift. With good installations of this kind, miners can enter the heading in anywhere from 20 to 30 minutes.

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The tables on this and following pages give location and various occupations where dust counts were taken; also, total averages of counts since 1933, when the first counts were taken:

TABLE XXI

DUST SAMPLES COLLECTED — ROCK AND ORE WORK

<u>Mine Or Plant</u>	<u>1956</u>	<u>1956</u>		<u>1956</u>	<u>1933 - 1956</u>
	<u>MISC.</u>	<u>IN ORE</u>	<u>IN ROCK</u>	<u>TOTAL</u>	<u>TOTAL</u>
ATHENS *	0	0	0	0	843
BUNKER HILL	0	1	4	5	30
CAMBRIA-JACKSON	0	8	2	10	394
CLIFFS SHAFT	0	0	0	0	1,952
HUMBOLDT	22	0	0	22	70
LLOYD **	0	0	0	0	775
MAAS	0	5	0	5	878
MATHER MINE, "A" SHAFT	0	5	1	6	902
MATHER MINE, "B" SHAFT	12	1	12	25	564
NEGAUNEE *	0	0	0	0	830
PELLETIZING PLANT	10	0	0	10	10
PRINCETON **	0	0	0	0	85
REPUBLIC	15	0	0	15	15
Research LABORATORY	9	0	0	9	48
SPIES-VIRGIL **	0	0	0	0	203
TILDEN	0	3	0	3	98
(Test MISCELLANEOUS Samples)	43	0	0	43	213
MESABA RANGE	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>20</u>
TOTALS	111	23	19	153	7,930

* Now a part of the Bunker Hill Mine

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TABLE XXII

VARIOUS OCCUPATIONS WHERE DUST SAMPLES WERE COLLECTED

Occupation	BUNKER HILL	CAMERIA-JACKSON	CLIFFS SHAFT	HUMBOLDT	MAAS	MATHER MINE, "A" SHAFT	MATHER MINE, "B" SHAFT	PELLET PLANT	REPUBLIC	RESEARCH LAB.	TILDEN	TOTALS
DRILLING		3			5	5	4					17
SCRAPING	3	6					3					12
LOADING CARS (LOADER)	2					1	4					7
CHARGING HOLES							1					1
CRUSHING ORE				22			12	10	15	9	1	69
LAYING TRACK												0
SURFACE CONVEYOR GALLERY												0
TIMBERING		1					1					2
BARRING BACK												0
LOADING AT POCKETS											2	2
TEST SAMPLES			43									43
TOTALS	5	10	43	22	5	6	25	10	15	9	3	153

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TABLE XXIII

AVERAGE LIGHT FIELD COUNT OF ALL SAMPLES TAKEN

<u>Mine Or Plant</u>	<u>1933</u>	<u>1934</u>	<u>1935</u>	<u>1936</u>	<u>1937</u>	<u>1938</u>	<u>1939</u>	<u>1940</u>
ATHENS		32.90	14.12	28.32	26.69	12.85	12.59	9.89
CAMBRIA-JACKSON *								
CLIFFS SHAFT	17.94	14.56	8.29	8.98	15.53	9.86	10.36	7.77
LLOYD		9.90	12.42	39.25	20.25	10.84	13.47	11.73
MAAS		7.46	27.55	35.75	150.98	11.24	36.90	8.71
MATHER MINE, "A" SHAFT *								
MATHER MINE, "B" SHAFT *								
NEGAUNEE		53.80	17.77	33.25	59.06	56.26	25.49	10.79
PRINCETON *								
SPIES-VIRGIL					70.61	26.99	1.80	8.40
TILDEN				67.52	285.27	74.60	60.40	
GARDNER-MACKINAW	27.77			8.61	48.53			
MISCELLANEOUS			8.66	3.00	6.80	14.73		

* Not In Operation During This Period

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TABLE XXIII (Cont'd.)

AVERAGE LIGHT FIELD COUNT OF ALL SAMPLES TAKEN

<u>Mine Or Plant</u>	<u>1941</u>	<u>1942</u>	<u>1943</u>	<u>1944</u>	<u>1945</u>	<u>1946</u>	<u>1947</u>	<u>1948</u>
ATHENS	7.28	25.80	4.90	8.33	6.64	4.17	7.39	7.49
CAMBRIA-JACKSON			12.10	6.21	17.05	11.99	9.30	13.81
CLIFFS SHAFT	8.18	7.55	5.99	6.23	8.18	6.34	8.64	5.12
LLOYD	8.05	6.95	5.01	14.45	6.49	9.38	11.17	12.97
MAAS	17.29	8.46	12.48	8.78	8.17	9.29	6.08	21.08
MATHER MINE, "A" SHAFT	2.42	5.58	6.64	7.57	8.39	7.72	10.88	9.50
MATHER MINE, "B" SHAFT							2.23	4.16
NEGAUNEE	14.02	17.02	4.65	11.81	11.92	6.67	7.05	5.48
PRINCETON			10.59	6.32	8.48			
SPIES-VIRGIL	6.97			5.59	14.22	3.59	11.65	5.24
TILDEN	49.60				24.18	66.92	33.65	2.93
GARDNER-MACKINAW *								
MISCELLANEOUS		3.00						

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TABLE XXIII (Cont'd.)

AVERAGE LIGHT FIELD COUNT OF ALL SAMPLES TAKEN

<u>Mine Or Plant</u>	<u>1949</u>	<u>1950</u>	<u>1951</u>	<u>1952</u>	<u>1953</u>	<u>1954</u>	<u>1955</u>	<u>1956</u>
ATHENS *	7.07	4.71	4.15	2.71	2.37			
BUNKER HILL						1.19	2.33	3.00
CAMBRIA-JACKSON	6.86	9.50	8.32	4.54	6.80	1.38	4.56	2.17
CLIFFS SHAFT	6.26	3.46	4.90	2.76	4.45	2.79	2.31	- Test - '56 (All Samples)
HUMBOLDT					1.59	27.57	6.34	10.04
LLOYD **	11.72	11.32	6.28	4.72	5.17	4.58	5.09	
MAAS	10.55	4.45	4.84	4.93	7.06	5.25	4.14	1.73
MATHER MINE, "A" SHAFT	8.40	7.01	8.75	5.86	5.15	3.77	1.38	5.29
MATHER MINE, "B" SHAFT	2.46	6.68	5.04	5.40	5.56	6.41	4.81	2.36
MESABA RANGE						20.28		
MEGAUNEE *			2.27	1.70	2.60			
PELLETIZING PLANT								17.65
PRINCETON **								
REPUBLIC								4.67
RESEARCH LAB.								5.29
SPIES-VIRGIL **	10.12	18.78	6.05	5.29	4.75	4.14		
TILDEN	4.38	3.74	6.34		3.05		2.36	1.68

* Now a part of the Bunker Hill Mine

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TABLE XXIV

COMPARISON OF DUST COUNTS IN RAISING TO DRIFTING

<u>Mine</u>	<u>Average In Raising</u>	<u>Average In Drifting</u>	<u>General Average *</u>
BUNKER HILL		3.00	3.00
CAMBRIA-JACKSON		1.65	2.17
CLIFFS SHAFT	(All Test Samples)		
MAAS		1.37	1.73
MATHER MINE, "A" SHAFT		4.52	5.29
MATHER MINE, "B" SHAFT		2.45	2.36

* Includes Miscellaneous and General Air Samples.

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TABLE XIV

AVERAGES IN ORE COMPARED TO AVERAGES IN ROCK

<u>Mine</u>	<u>Average In Ore</u>	<u>Average In Rock</u>	<u>General Average *</u>
BUNKER HILL	1.24	3.44	3.00
CAMBRIA-JACKSON	2.23	1.91	2.17
CLIFFS SHAFT	(All Test Samples)		
MAAS	1.73	-	1.73
MATHER MINE, "A" SHAFT	6.16	.94	5.29
MATHER MINE, "B" SHAFT	2.92	2.45	2.36

* Includes Miscellaneous and General Air Samples.