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Washing Plant (con't)

<u>Source of Delay</u>	<u>Delay Hours</u>	<u>Per Cent of Total Hours Worked</u>
Pumps and Pipelines	14.75	1.03
Conveyors	4.25	0.30
Concentrate Stacker	<u>1.50</u>	<u>0.11</u>
	72.08	5.06

Retreat Plant

Out of Surge	5.75	0.35
Media Circuit	9.91	0.61
Conveyors	5.41	0.33
Electric Power	3.75	0.23
Heavy-Media Plant Machines	18.50	1.14
Co ncentrate Stacker	1.50	0.09
Pumps and Pipelines	<u>22.50</u>	<u>1.39</u>
	67.32	4.14

9. MAINTENANCE AND REPAIRS

Winter repairs to concentrating plant equipment were carried on from the first of the year until the beginning of ore season. In addition to the usual repairs to plant equipment, a third secondary screen was installed in the washing plant and the concentrate stockpiling system was remodeled. This remodeling consisted of widening the track gauge for more stability and installation of equipment for automatic travel to aid in producing a uniform grade of concentrates from stockpile.

Overhauling of all pit equipment, including shovels, trucks, tractors, etc., underway at the end of the 1953 season, continued into 1954 until the beginning of ore season.

Movement, erection, and repair of stripping conveyor equipment on the West Snyder forty, started in the fall of 1953, continued until the start of conveyor stripping on May 10.

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There was no repair or maintenance work done on any plant, pit, or stripping conveyor equipment after the end of the ore and stripping seasons.

The following alterations have been proposed and approved at the concentrating plant:

1. A 24-inch cyclone and a 40-foot thickener to be installed for the purpose of recirculating the Heavy-Media tailings water. This will decrease the amount of tailings to be pumped to the basin by approximately 1,300 gallons per minute and will improve the operation of the fine ore plant when it is operating on classifier overflows, and will eliminate the necessity of installing an additional tailings line from the fine ore plant to the basin.
2. In order to have sufficient cleaning capacity, a 24" x 36" drum type separator is to be added to the second unit of Heavy-Media.

At the stripping conveyor, consideration is being given to revision of the drive mechanism on the wobbler feeder.

## 10. COST OF PRODUCTION

### a. Comparative Mining Costs

<u>Product</u>	<u>1954</u>	<u>1953</u>
Wash Concentrates	65,004	121,105
Retreat Concentrates	463,654	619,807
Classifier Fine Concentrates		21,528
Tailings Basin Fines Concentrates		<u>15,078</u>
	<u>528,658</u>	<u>777,518</u>

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<u>Product</u>	<u>1954</u>	<u>1953</u>
Per Cent Recovery	43.31	49.45*
Average Product Per Shift	3,014	3,545
Tons Per Man Per Day	40.70	42.99
Days Operated	88	112

\*Fine Ore Plant Product Excluded

	<u>Budget</u> <u>1954</u>	<u>Cost</u> <u>Per Ton</u> <u>1953</u>	<u>Cost</u> <u>Per Ton</u> <u>1954</u>
Pit Operating-Crude	\$0.293	\$0.239	\$0.283
Concentrating-Crude	0.142	0.104	0.127
Rewashing Tailings-Fine Ore Concls.)		1.321	
Loading Stockpile Ore-Concentrates	0.018	0.013	0.017
General Mine Expense-Concentrates	0.266	0.189	0.290
Winter & Idle Expense-Concentrates	<u>0.659</u>	<u>0.595</u>	<u>0.782</u>
Cost of Production	\$1.901	\$1.520	\$2.035
<u>Depreciation</u>			
Plant and Equipment		0.146	0.195
Motorized Equipment		0.072	0.083
Movable Equipment		0.006	0.009
<u>Amortization</u>			
Leasehold		0.126	0.126
Stripping			0.130
<u>Taxes</u>			
Ad Valorem		0.240	0.308
Occupational		0.375	0.417
Royalty		<u>0.043</u>	<u>0.043</u>
Total: Depreciation-Amortization-Taxes		\$1.008	\$1.311
Miscellaneous Expense and Income		<u>.000</u>	<u>.000</u>
<u>Total Cost at Mine</u>		\$2.528	\$3.346

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b. Detailed Cost Comparison

Decrease in tonnage was the main reason for the increased costs over 1953 and over the budget estimate. This decrease was approximately 32 per cent under 1953 and 9 per cent under the tonnage estimated in the budget. Winter & Idle and General Mine expense were the two items most affected by the decrease in tonnage.

Decrease in recovery of approximately 6 per cent, a general over-all wage increase for hourly employees, and a 4-day week also helped increase cost of production for 1954 over 1953 costs.

Pit operating costs were \$0.010 below the budget estimate and \$0.044 over 1953 costs. In comparing with 1953 costs, the largest increases were noted in truck rental (\$0.034 increase) and pit cleanup expense (\$0.032 increase).

Concentrating costs were \$0.015 below the budget estimate and \$0.025 over 1953 costs. The increase in costs over 1953 is almost entirely due to the addition of the second unit of Heavy-Media.

General mine expense costs were \$0.024 over the budget estimate and \$0.101 over 1953 costs. The decrease in tonnage as noted above accounts for most of this increase. Overhead charges were reduced to some extent, but not in proportion to the reduction in tonnage.

Winter & Idle costs were \$0.123 over the budget estimate and \$0.187 over 1953 costs. As stated previously, the increase in cost per ton was due almost entirely to the decrease in tonnage. The actual amount of money spent was approximately 11 per cent less than in 1953. Most of this expenditure was incurred prior to the start of the 1954 ore season.

11. EXPLORATION AND FUTURE EXPLORATION

No exploratory drilling was done at the Canisteo mine during the year.

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There are two areas of interest where additional drilling will have to be done before possible pit extensions can be definitely established. One is along the east side of the pit on the Hemmens and South Bovey forties; the other is the possible pit extension on the North Bovey forties; in both cases, a very lean low grade concentrate is indicated.

## 12. TAXES

	1954		1953		Decrease Increase	
	Assessed Value	Taxes	Assessed Value	Taxes	Assessed Value	Taxes
Mineral	\$ 848,067	\$130,147.52	\$1,031,033	\$157,191.29	-\$182,966	-\$27,043.77
Land,Bldg,Mach.	79,664	12,457.70	60,768	9,484.66	18,896	2,973.04
<u>Personal Property</u>						
Equipment	98,879	15,153.21	102,068	15,858.89	- 3,189	- 705.68
Stockpile	2,808	430.33			2,808	430.33
Tailings Basin S.P.	36,231	5,552.40	26,720	4,073.73	9,511	1,478.67
Total	\$1,065,649	\$163,741.16	\$1,220,589	\$186,608.57	-\$154,940	-\$22,867.41
Avg. Mill Rate		153.65		152.88	Increase: 1/2 of 1%	

Mineral reserve decreased by re-estimate of tonnage and reduction of 60 per cent per ton in value of ores classified as doubtful for concentrates. Village of Coleraine: All building values increased by 20 per cent by order of Commissioner of Taxation. Tailings Basin Stockpile: Per ton value re-valued by State from \$0.167 per ton in 1953 to \$0.25 per ton in 1954.

### Tax Commission Reserve

	Tons <u>1954</u>	Tons <u>1953</u>	Increase <u>Decrease</u>
May 1	5,658,998	6,137,845	-478,847
Tailings Basin	144,922	160,000	- 15,078

Mineral reserve decreased by production and re-estimate.  
Tailings basin decreased by production.

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### 13. ACCIDENT AND PERSONAL INJURY

There were 38 slight accidents at the Canisteo mine in 1954. Five lost-time accidents are described as follows:

<u>Name</u>	<u>Date of Injury</u>	<u>Cause</u>	<u>Nature</u>	<u>Days Lost</u>
Robert Thorton	1-19-54	While unloading fairlead iron, piece of iron slipped out of Lull loader, striking face, left side of chest, left leg.	Contusion & laceration of nose, upper lip, left lower chest, and left leg.	17
Frank L. Suber	4-22-54	Slipped when he stepped on cleat on walk while inspecting chains and scales preparatory to testing them. Reached out to balance and strained muscles.	Strained right shoulder muscle and neck. Edema of conjunctive.	11
George Hecimovich	4-23-54	While directing truck into truck shop, truck canopy hooked onto crane travel cable. Hecimovich went on the blind side to hold cable clear; truck moved forward, striking a tire leaning against steel beam, causing it to roll and hit him on right leg from behind.	Pott's fracture of right ankle.	35
Steve Latkovich	6-16-54	Latkovich, dumpman at stripping conveyor dump, walked across haul road in view of approaching truck to get raincoat at #3 transfer station. Latkovich was seen by driver and truck was seen by Latkovich. Driver continued up dump, making 180° clockwise turn to position truck for reversing to dump site. Dumpman, not realizing speed of truck, tried to run around rear of box to signal for dumping and was struck on head by left rear corner of box. Impact threw him off balance, causing him to fall in path of rear left wheels. Driver, seeing shadow, stopped to investigate and found him lying on ground with left knee injured by tire. Truck stopped in sufficient time to prevent wheels rolling over his legs.	Contusion left knee-medial area-much edema-strained medial ligaments.	37½

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<u>Name</u>	<u>Date of Injury</u>	<u>Cause</u>	<u>Nature</u>	<u>Days Lost</u>
Eino Hamar	8-6-54	Hamar was pulled in with bar caught between roller and moving belt while in process of removing clay from return roller on screening plant shuttle conveyor with short bar. Right arm passed between roller and belt up to shoulder.	Abrasion and contusion right shoulder. X ray negative.	75

14. PROPOSED NEW CONSTRUCTION

There is no major construction planned for 1955.

15. EQUIPMENT RECEIVED DURING 1954

3 34-Ton Euclid Trucks on Rental  
1 Vacuum Pump for Shop Heating Plant  
1 2-1/2 Ton Ford Service Truck  
1 525-Foot 36-Inch Conveyor Belt  
1 3/4-Ton Ford Pickup Truck

16. PROPOSED NEW EQUIPMENT

2 Pickup Trucks  
1 Lull Loader

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1. GENERAL

Stripping operations at the Hawkins mine, in progress at the end of 1953, were completed on January 30, 1954, and repairs to equipment were begun. On January 24, 1954, a fire started by an overturned salamander completely destroyed the MacKillican service garage.

Repairs to plant and equipment continued until May 7, when the 1954 ore season got underway. Ore operations, starting on a 2-shift, 5-day-per-week basis, continued on this schedule until July 12, at which time, due to a reduction in ore requirements, the schedule was placed on a 2-shift, 4-day-week basis.

The International Harvester fines plant was scheduled on a 16-shift-per-week basis and a swing crew used to give each crew 4 days per week, thus coinciding with mine crew schedules. This schedule remained in effect until completion of production on October 6.

Ore production from the Hawkins and MacKillican mines was completed on September 16 and crews were shifted to stripping on a 16-shift-per-week basis, giving each crew 4 days per week.

Stripping was completed in both the Hawkins and MacKillican mines on November 11. During this time, a new entrance road to serve both the Hawkins and MacKillican mines was completed along the South MacKillican line. Shops were drained for complete shut-down of the mine on November 12. All hourly employees were laid off and foremen used as watchmen. Automatic pumping controls were installed to eliminate the need for pumpmen.

Four cars of scrap were loaded.



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d. Production by Months

Month	<u>Crude</u>					Total	I.H.C. Fines
	Hawkins		MacKillican				
	Wash	Retreat	Wash	Retreat	Fines		
May	32,715	122,155				154,870	30,290
June	28,686	231,061				259,747	48,438
July	19,790	66,787	9,545	102,107		198,229	50,718
Aug.			5,534	188,479		194,013	46,551
Sept.	23,360	53,098		24,973		101,431	43,176
Oct.							8,226
	<u>104,551</u>	<u>473,101</u>	<u>15,079</u>	<u>315,559</u>		<u>908,290</u>	<u>227,399</u>

Month	<u>Concentrates</u>					Total	I.H.C. Fines
	Wash	Retreat	Wash	Retreat	Fines		
May	16,136	62,570				78,706	16,613
June	15,932	120,638				136,570	21,062
July	9,932	30,878	5,251	48,958	3,069	98,088	20,546
Aug.			4,230	87,167		91,397	19,733
Sept.	12,812	26,262	409	13,620		53,103	17,571
Oct.							5,471
	<u>54,812</u>	<u>240,348</u>	<u>9,890</u>	<u>149,745</u>	<u>3,069</u>	<u>457,864</u>	<u>100,996</u>

3. ANALYSIS

a. Tonnage and Analyses of Crude Ore Produced

	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>
Hawkins Wash	104,551	42.31	.032	34.24
Hawkins Retreat	473,101	47.30	.053	27.75
MacKillican Wash	15,079	44.02	.057	31.33
MacKillican Retreat	<u>315,559</u>	<u>46.60</u>	<u>.053</u>	<u>28.95</u>
	908,290	46.43	.050	28.97
I.H.C. Fines	227,399	46.29	.029	29.61

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## 2. PRODUCTION, SHIPMENTS and INVENTORIES

### a. Production by Grades

	<u>Crude</u>	<u>Wash</u>	<u>Retreat</u>	<u>Total</u>
Hawkins		104,551	473,101	577,652
MacKillican		<u>15,079</u>	<u>315,559</u>	<u>330,638</u>
		119,630	788,660	908,290
I.H.C.Fines				227,399

<u>Concentrates</u>	<u>Tons</u>				<u>Fines</u>	<u>Total</u>
	<u>Bessemer</u>		<u>Non Bessemer</u>			
	<u>Wash</u>	<u>Retreat</u>	<u>Wash</u>	<u>Retreat</u>		
Hawkins	34,821	68,117	19,991	172,231		295,160
I.H.C.					100,996	100,996
MacKillican			<u>9,890</u>	<u>149,745</u>	<u>3,069</u>	<u>162,704</u>
	<u>34,821</u>	<u>68,117</u>	<u>29,881</u>	<u>321,976</u>	<u>104,065</u>	<u>558,860</u>

### b. Shipments by Grades

Hawkins	40,010	81,690	12,051	155,068		288,819
I.H.C.					100,996	100,996
MacKillican	<u>15,079</u>	<u>315,559</u>	<u>9,890</u>	<u>149,745</u>	<u>3,069</u>	<u>493,342</u>
	55,089	397,249	21,941	304,813	104,065	883,157

### c. Stockpile Inventories

	<u>Concentrates</u>	<u>Tons</u>
Hawkins-Wash		8,839
Hawkins-Retreat		<u>31,056</u>
		39,895

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b. Tonnage and Analyses of Concentrates Produced

	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>	<u>Moisture</u>
Hawkins Bessemer Wash	34,821	57.37	.030	10.42	.21	.35	6.99
Hawkins Non Bessemer Wash	19,991	57.91	.036	9.87	.23	.41	7.00
Hawkins Bessemer Retreat	68,117	57.85	.036	10.82	.27	.56	6.93
Hawkins Non Bessemer Retreat	<u>172,231</u>	<u>58.45</u>	<u>.067</u>	<u>11.70</u>	<u>.25</u>	<u>.95</u>	<u>8.33</u>
	295,160	58.15	.054	11.22	.25	.75	7.76
Hawkins I.H.C. Fines	100,996	58.33	.034	11.97	.26	.51	8.94
MacKillican Wash	9,890	56.35	.085	11.41	.44	.78	8.66
MacKillican Retreat	149,745	57.55	.062	13.16	.29	.83	8.18
MacKillican Fines	<u>3,069</u>	<u>56.85</u>	<u>.061</u>	<u>13.84</u>	<u>.39</u>	<u>.97</u>	<u>9.06</u>
	162,704	57.46	.063	13.07	.30	.83	8.23

c. Tonnage and Complete Analyses of Concentrates Shipped

<u>Hawkins</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>
Bessemer Wash	40,010	57.20	.031	10.89	.27	.37	.10	.10	.009	6.29	6.92
Non Bessemer Wash	12,051	57.53	.035	10.55	.26	.44	.10	.10	.009	6.09	6.95
Bessemer Retreat	81,690	57.55	.038	11.29	.32	.56	.10	.10	.009	5.11	6.69
Non Bessemer Retreat	<u>155,068</u>	<u>58.27</u>	<u>.064</u>	<u>11.87</u>	<u>.28</u>	<u>.89</u>	<u>.10</u>	<u>.10</u>	<u>.009</u>	<u>3.17</u>	<u>7.97</u>
	288,819	57.89	.051	11.52	.29	.71	.10	.10	.009	4.26	7.42
I.H.C.Fines	100,996	58.33	.034	11.97	.26	.51					
<u>MacKillican</u>											
Wash	9,890	56.64	.081	11.63	.41	.79	.28	.22	.011	5.31	8.40
Retreat	149,745	57.45	.061	13.28	.30	.86	.30	.20	.010	2.64	8.09
Fines	<u>3,069</u>	<u>56.91</u>	<u>.061</u>	<u>13.86</u>	<u>.45</u>	<u>.97</u>	<u>.29</u>	<u>.21</u>	<u>.011</u>	<u>2.50</u>	<u>9.05</u>
	162,704	57.39	.062	13.19	.31	.33	.30	.20	.010	3.33	8.13

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d. Tonnage and Analysis of Ore in Stockpile

	<u>Hawkins</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>	<u>Moisture</u>
Wash		8,839	58.29	.039	9.20	.21	.39	7.02
Retreat		<u>31,056</u>	<u>58.60</u>	<u>.077</u>	<u>11.41</u>	<u>.30</u>	<u>.97</u>	<u>8.88</u>
		39,895	58.53	.069	10.92	.28	.84	8.47

4. ESTIMATE of ORE RESERVES

a. Developed Ore - Factors Used

<u>Concentrates</u>	<u>Cubic Feed Per Ton</u>	<u>Rock Deduction</u>	<u>Per Cent Recovery</u>
Wash	14	0	60
Lean Wash	14	0	40
Low Grade Wash	14	0	55
Lean Low Grade Wash	14	0	40
Retreat	14	0	40

b. Estimated Reserves

<u>Hawkins Concentrates</u>	<u>Reserve 12-31-53</u>	<u>Mined</u>	<u>Balance After Mining</u>	<u>Changed by Re-estimate</u>	<u>Reserve 12-31-54</u>
<u>SE-NE 31, 57-22</u>					
Open Pit Wash	532,542	1,410	531,132		531,132
Open Pit Retreat	628,556	4,589	623,967		623,967
Underground Wash					
Underground Retreat					
	<u>1,161,098</u>	<u>5,999</u>	<u>1,155,099</u>		<u>1,155,099</u>
<u>NE-SE 31, 57-22</u>					
Open Pit Wash	897,719	38,007	859,712		859,712
Open Pit Retreat	995,307	203,988	791,319		791,319
Underground Wash	81,074		81,074		81,074
Underground Retreat	<u>364,806</u>		<u>364,806</u>		<u>364,806</u>
	<u>2,338,906</u>	<u>241,995</u>	<u>2,096,911</u>		<u>2,096,911</u>

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b. Estimated Reserves (con't)

<u>Hawkins Concentrates</u>	<u>Reserves 12-31-53</u>	<u>Mining</u>	<u>Balance After Mining</u>	<u>Changed by Re-estimate</u>	<u>Reserves 12-31-54</u>
<u>SW-NW 32, 57-22</u>					
Open Pit Wash	215,500	11,512	203,988		203,988
Open Pit Retreat	931,818	26,194	905,624		905,624
Underground Wash	150,819		150,819		150,819
Underground Retreat	<u>265,513</u>		<u>265,513</u>		<u>265,513</u>
	1,563,650	37,706	1,525,944		1,525,944
<u>NW-SW 32, 57-22</u>					
Open Pit Wash	71,908	3,883	68,025	-5,577	62,448
Open Pit Retreat	640	5,577	- 4,937	<u>75,577</u>	640
Underground Wash	687,053		687,053		687,053
Underground Retreat	<u>56,138</u>		<u>56,138</u>		<u>56,138</u>
	815,739	9,460	806,279		806,279
<u>Total Hawkins</u>	5,879,393	295,160	5,584,233		5,584,233

c. Estimated Analysis of Ore Reserves

<u>Hawkins Concentrates</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>
<u>SE-NE 31, 57-22</u>				
Bessemer Wash Pit-Open	335,496	59.66	.033	10.64
Non Bessemer Wash Open Pit	195,636	57.05	.055	11.41
Bessemer Retreat Open Pit	313,777	59.09	.032	11.49
Non Bessemer Retreat Open Pit	<u>310,190</u>	<u>59.32</u>	<u>.055</u>	<u>11.44</u>
	1,155,099	58.97	.042	11.22
<u>NE-SE 31, 57-22</u>				
Bessemer Wash Open Pit	648,105	56.90	.029	11.57
Non Bessemer Wash Open Pit	211,607	58.02	.056	11.29
Bessemer Retreat Open Pit	754,367	56.01	.027	13.43
Non Bessemer Retreat Open Pit	36,952	56.21	.056	13.61
Bessemer Wash Underground	75,588	56.60	.028	11.60
Non Bessemer Wash Underground	5,486	57.05	.067	11.12
Bessemer Retreat Underground	326,588	55.97	.029	13.44
Non Bessemer Retreat Underground	<u>38,218</u>	<u>55.97</u>	<u>.053</u>	<u>13.44</u>
	2,096,911	56.51	.032	12.57

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

<u>Hawkins Concentrates</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>
<u>SW-NW 32, 57-22</u>				
Bessemer Wash Open Pit	179,549	56.65	.031	10.53
Non Bessemer Wash Open Pit	24,439	57.27	.059	11.72
Bessemer Retreat Open Pit	575,529	56.26	.028	12.21
Non Bessemer Retreat Open Pit	330,095	56.05	.063	11.96
Bessemer Wash Underground	92,877	57.23	.030	11.16
Non Bessemer Wash Underground	57,942	57.48	.056	11.27
Bessemer Retreat Underground	213,398	56.39	.029	12.16
Non Bessemer Retreat Underground	52,115	56.39	.056	12.16
	<u>1,525,944</u>	56.40	.039	11.84
<u>NW-SW 32, 57-22</u>				
Bessemer Wash Open Pit	29,488	57.55	.035	10.56
Non Bessemer Wash Open Pit	32,960	57.62	.058	10.98
Non Bessemer Retreat Open Pit	640	55.56	.070	11.96
Bessemer Wash Underground	308,557	57.25	.031	10.48
Non Bessemer Wash Underground	378,496	55.75	.060	11.39
Non Bessemer Retreat Underground	56,138	55.56	.070	11.96
	<u>806,279</u>	56.45	.049	11.03
Total Bessemer Wash Open Pit	1,192,638	57.65	.031	11.13
Total Non Bessemer Wash Open Pit	<u>464,642</u>	<u>57.54</u>	<u>.056</u>	<u>11.34</u>
<u>Total Wash Open Pit</u>	<u>1,657,280</u>	57.62	.042	11.19
Total Bessemer Retreat Open Pit	1,643,673	56.69	.028	12.63
Total Non Bess Retreat Open Pit	<u>677,877</u>	<u>57.55</u>	<u>.059</u>	<u>11.81</u>
<u>Total Retreat Open Pit</u>	<u>2,321,550</u>	56.94	.037	12.39
Total Bessemer Wash Underground	477,022	57.14	.030	10.79
Total Non Bess Wash Underground	<u>441,924</u>	<u>55.99</u>	<u>.060</u>	<u>11.37</u>
<u>Total Wash Underground</u>	<u>918,946</u>	56.59	.044	11.07
Total Bessemer Retreat Underground	539,986	56.14	.029	12.93
Total Non Bess Retreat Underground	<u>146,471</u>	<u>55.96</u>	<u>.057</u>	<u>12.41</u>
<u>Total Retreat Underground</u>	<u>686,457</u>	56.10	.036	12.82
<u>Total Hawkins Concentrates</u>	<u>5,584,233</u>	56.98	.038	11.87

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5. LABOR and WAGES

a. Comments

Labor was plentiful during the entire year, with very little turnover in spite of a 4-day-per-week operation.

On July 1, 1954, in accord with the Union contract, a raise of \$0.05 per hour was put into effect.

b. Comparative Statement of Production

<u>Product</u>	<u>457,864 Tons Concentrates</u>
Number of Shifts and Hours	2 Shifts, 8 Hours
Average Number of Men Working	140
Average Wages per Hour	\$2.3280
Product per Man per Day	39.61
Labor Cost per Man per Ton	\$0.4892
Total Number of Days	83
Amount Paid for Labor	\$223,966.86

6. GENERAL SURFACE

a. Building and Repairs

Only minor and necessary repairs were made to mine buildings.

Four cars of accumulated scrap iron were loaded and sold.

b. Roads

The new entrance road into the East MacKillican pit was completed to serve both the Hawkins and MacKillican mines.

c. Power Lines

A new shovel power line was installed in the Hawkins mine to service shovels in the south end of the pit.

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7. OPEN PIT

a. Stripping

Hawkins rock stripping, in progress at the beginning of the year, continued on a 20-shift-per-week basis until January 30 when operations were suspended for winter repair.

After the close of ore season on September 16, stripping operations resumed on the south side of the Hawkins and the West MacKillican pit, removing paint rock below the ore areas mined in 1954; operations were then shifted to the East MacKillican pit, completing a new entrance road and removing surface overburden on the road vacated, thereby releasing ore under the road.

Stripping operations were completed on November 11, 1954, and a complete shutdown of the mine was effected. Weather and working conditions were ideal and a good cost was realized.

Following is a tabulation showing stripping removed, man hours, and cost per yard for the year for the Hawkins and MacKillican mines:

Hawkins Stripping

<u>E&amp;A</u>	<u>Cubic Yards</u>	<u>Yards Per Shift</u>	<u>Man Hours</u>	<u>Cost Per Yard</u>
599	321,684	3,656	24,263	\$0.551
620	15,920	3,184	1,260	0.627
649	224,355	3,802	10,855	0.349
653	<u>36,227</u>	<u>1,906</u>	<u>2,548</u>	<u>0.391</u>
	598,186	3,498	38,926	\$0.468

MacKillican Stripping

237,487	3,653	13,371	\$0.333
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Total Hawkins-MacKillican Stripping 1954

835,673	3,541	52,297	\$0.429
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b. Open Pit Mining

The 1954 ore season began on May 7, working alternately between the Hawkins and MacKillican mines. In order to meet low phos grade requirements, production was concentrated on the south side along the MacKillican line and on the pit bottom. Upper painty ore slowed production as it could not be pushed through the plant as fast as the lower ore and still maintain grade. However, a very good grade of ore was produced and recovery was better than had been anticipated.

MacKillican production came entirely from the upper painty horizon in the West pit and included considerably more rock than was found on the Hawkins side of the line. Here again, the plant could not take the crude ore as fast as the lower ore, as a good job of washing had to be done in the plant in order to retreat properly. As in the Hawkins, a better grade of ore was produced than had been estimated and recovery was somewhat better.

Due to reduced ore requirements, schedules were cut on July 12 from a 2-shift, 5-day week to a 2-shift, 4-day week.

Ore operations were completed on September 16, 1954.

		Crude					
		Wash Plant			Pit		
		Plant	Pit	Tons	Pit	Tons	Cost
<u>Hawkins</u>	<u>Shifts</u>	Crude	Rock	Screen Reject	Crude	Per Shift	Per Ton
Wash	17	104,551		3,895	108,446	6,379	\$0.275
Retreat	86	<u>473,101</u>	<u>4,510</u>	<u>94,033</u>	<u>567,134</u>	<u>6,595</u>	<u>0.275</u>
	103	577,652	4,510	97,928	675,580	6,559	\$0.275
<u>MacKillican</u>							
Wash	4	15,079		896	15,975	3,994	\$0.252
Retreat	59	<u>315,559</u>		<u>82,432</u>	<u>397,991</u>	<u>6,746</u>	<u>0.252</u>
	63	330,638		83,328	413,966	6,571	\$0.252
Total Wash	21	119,630		4,791	124,421	5,925	\$0.266
Total Retreat	<u>145</u>	<u>788,660</u>	<u>4,510</u>	<u>176,465</u>	<u>965,125</u>	<u>6,656</u>	<u>0.266</u>
	166	908,290	4,510	181,256	1,089,546	6,383	\$0.266

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c. Pumping and Drainage

Automatic pump controls were installed on all pumps, thereby eliminating pumpmen. Regular pumping in the Hawkins pit amounted to approximately 1,500 gallons per minute.

d. General Pit Activities

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

8. BENEFICIATION

a. Washing Plant

Plant operation was greatly improved production wise and grade wise with the installation of 2-inch scalping and magnetic cobbers on the cyclone and the revamping of conveyors, chutes, sumps, etc.. Although considerable time and money was charged against Winter & Idle costs, and in spite of the 4-day work week and reduced tonnage, a good saving was made during the operating season over previous years.

During the operating season, it was necessary to add additional clear water pumping capacity in order to do a better cleaning job on the painty ore which had to be treated this year; it was also necessary to maintain a slower rate of feed through the plant in order to clean the ore for treatment in the retreat plant. Despite this, plant operations were very satisfactory.

The operating season extended from May 7 to September 16, with the same shift schedule as the pit.

A brief statement showing lost time and its percentage of total operating time is as follows:

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Washing Plant Delays

<u>Source of Delays</u>	<u>Hours</u>	<u>Per Cent</u>	<u>Per Cent of 1344.00 Working Hours</u>
Out of Ore	9.21	19.27	0.69
Pit Screening Plant	5.34	11.17	0.40
Crude Ore Conveyor	6.85	14.33	0.51
Crusher Feed Conveyor	0.12	0.25	0.01
Primary Screens	2.95	6.17	0.22
Crushers	1.42	2.97	0.11
Secondary Screens	3.53	7.38	0.26
Surge Pile Full	0.83	1.74	0.06
Classifiers	1.33	2.78	0.10
Coarse Concentrate Conveyor	1.88	3.93	0.14
Fine Concentrate Conveyor	0.67	1.40	0.05
Stockpile Conveyor	2.50	5.23	0.19
Miscellaneous Chutes & Conveyor	3.34	6.99	0.25
Air Compressor	0.33	0.69	0.03
Electric Power	0.50	1.05	0.04
Miscellaneous Starting Delays	<u>7.00</u>	<u>14.65</u>	<u>0.52</u>
	47.80	100.00	3.56

Recapitulation

Crude Ore Delays (Ore to Head of Mill)	21.40	44.77	1.60
Ore Processing Delays	<u>26.40</u>	<u>55.23</u>	<u>1.96</u>
	47.80	100.00	3.56

b. Retreat Plant

With improved feed from the washing plant, a very satisfactory operation was realized in the Heavy-Media plant. Only minor changes are anticipated for the coming ore season.

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Heavy-Media Plant Delays

<u>Source of Delays</u>	<u>Hours</u>	<u>Per Cent</u>	<u>Per Cent of 1256.50 Working Hours</u>
Out of Ore	4.25	5.25	0.34
Heavy-Media Feed Conveyor	0.33	0.41	0.03
Akins Separator	20.67	25.57	1.65
Coarse Concentrator Wash Scr.	9.17	11.34	0.72
Fine Concentrator Wash Screen	7.00	8.66	0.56
Fine Reject Wash Screen	2.00	2.47	0.16
Magnetic Separators	6.75	8.35	0.54
Crockett Sand Pump	0.33	0.41	0.03
Densifiers	0.50	0.62	0.04
Stockpile Conveyor	1.00	1.24	0.08
Plant Weekend Tie-up	5.00	6.19	0.39
Plant Weekend Charge-up	12.75	15.77	1.00
Electric Power	3.50	4.33	0.28
Miscellaneous Starting Delays	7.00	8.66	0.56
Waiting for Rock Truck	0.58	0.72	0.05
	<u>80.83</u>	<u>100.00</u>	<u>6.43</u>

Recapitulation

Crude Ore Delays (Ore to Head of Mill)	4.25	5.26	0.34
Ore Processing Delays	<u>76.58</u>	<u>94.74</u>	<u>6.09</u>
	<u>80.83</u>	<u>100.00</u>	<u>6.43</u>

c. Cyclone Plant

Plant operation, although improved by the installation of magnetic cobbers on the feed to remove magnetite, was still not satisfactory. It was found that with a slow rate of feed a good grade could be made; but with the entire plant production going through, there was not enough magnetic separator capacity to handle the tonnage and the media losses would increase beyond economic reason. Additional magnetic separators are being installed this winter to bring these losses within reason.

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A good deal of the ore treated this year was fairly high in iron content so that the cyclone plant could be bypassed and grade could be maintained.

d. International Harvester Tailings Basin Plant

The International Harvester tailings plant started operations on May 10 on a 3-shift, 5-day-per-week basis and continued until July 16 when a 16-shift-per-week schedule went into effect using 4 crews 4 days per week. Plant operations were satisfactory both as to grade and production. When the 1954 operating season closed on October 6, the mined-out area of the pond was dyked off and is to be used as a tailing basin for future operations.

A total of 227,399 tons of crude ore was processed to produce 100,996 tons of concentrates at an average recovery of 44.41 per cent.

I.H.C. Tailings Basin Plant Delays

Source of <u>Delays</u>	<u>Hours</u>	Per <u>Cent</u>	Per Cent of 2624 <u>Working Hours</u>
Dragline	80.42	22.16	3.07
Move Screening Plant	32.75	9.03	1.25
Feeder Screening Plant	37.07	10.22	1.41
Trash Screen-Screening Plant	6.67	1.84	0.25
Trash Conveyor-Screening Plant	0.50	0.14	0.02
Feed Pump-Screening Plant	27.00	7.44	1.03
Screening Plant-General	22.36	6.16	0.85
Plant Feed Pipeline	30.19	8.32	1.15
Trash Screen	3.00	0.83	0.11
Trash Conveyor	9.75	2.69	0.37
Hydroseparator	24.50	6.75	0.94
Hydroseparator Underflow Pump	0.38	0.10	0.01
Sizer Feed Lines	1.00	0.28	0.04
Sizers	4.00	1.10	0.15
Spiral Feed Pumps	1.62	0.45	0.06
Spirals	0.37	0.10	0.01
Concentrate Pump	23.12	6.37	0.89

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<u>Source of Delays</u>	<u>Hours</u>	<u>Per Cent</u>	<u>Per Cent of 2624 Working Hours</u>
Concentrate Pipeline	2.75	0.76	0.10
Dewatering Classifier	5.75	1.58	0.22
Railroad Cars and Tracks	19.83	5.46	0.76
Clear Water Pump	8.88	2.45	0.34
Clear Water Line	8.62	2.38	0.33
Tailings Line	1.00	0.28	0.04
Electric Power	1.25	0.34	0.05
Miscellaneous Chute & Launder	0.34	0.09	0.01
Miscellaneous Starting Delays	2.92	0.80	0.11
Plant Startup and Tie-up	6.83	1.88	0.26
	<u>362.87</u>	<u>100.00</u>	<u>13.83</u>

Recapitulation

Crude Ore Delays (Ore to Head of Mill)	236.97	65.30	9.03
Ore Processing Delay	<u>125.90</u>	<u>34.70</u>	<u>4.80</u>
	<u>362.87</u>	<u>100.00</u>	<u>13.83</u>

Note: This includes all repairs made to plant during 1954 operating season.

e. Complete Concentration Data for 1954

<u>Hawkins Washing Plant Product</u>	<u>Tonnage</u>	<u>Per Cent of Total Mined</u>	<u>Per Cent Iron Dried</u>	<u>Recovery</u>	
				<u>Tonnage</u>	<u>Iron Unit</u>
Crude Ore & Rock Mined	108,446	100.00	41.73		
Less Rock Removed in Mining					
Crude Ore Transfer to Screen Plant	108,446	100.00	41.73		
Less Rock Rejects in Screen Plant	3,895	3.59	26.08		
Crude Ore Entering Mill	104,551	96.41	42.31		
Concentrates Produced	54,812	50.54	57.57	52.43	71.33
Tailings (by Deduction)	49,739	45.87	25.49		

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Hawkins Retreat Plant Product	Tonnage	Per Cent of Total Mined	Per Cent Iron Dried	Recovery	
				Tonnage	Iron Unit
Crude Ore and Rock Mined	571,644	100.00	43.60		
Less Rock Removed in Mining	4,510	.79	25.70		
Crude Ore Transfer to Screen Plant	567,134	99.21	43.74		
Less Rock Rejects in Screen Plant	94,033	16.45	26.32		
Crude Ore Entering Mill	473,101	82.76	47.20		
Concentrates Produced	240,348	42.04	58.28	50.80	62.72
Heavy Density Rejects Scalped	46,358	8.11	43.39		
Tailings (by Deduction)	186,395	32.61	33.86		

MacKillican Mine  
Washing Plant

Crude Ore and Rock Mined	15,975	100.00	42.94		
Less Rock Removed in Mining					
Crude Ore Transfer to Screen Plant	15,975	100.00	42.94		
Less Rock Rejects in Screen Plant	896	5.61	24.85		
Crude Ore Entering Mill	15,079	94.39	44.02		
Concentrates Produced	10,240*		56.64	67.91	87.38
Tailings (by Deduction)	4,839		17.31		

\*Includes 350 Tons Fines Concts.

MacKillican Mine  
Retreat Plant

Crude Ore and Rock Mined	397,991	100.00	42.47		
Less Rock Removed in Mining					
Crude Ore Transfer to Screen Plant	397,991	100.00	42.47		
Less Rock Rejects in Screen Plant	82,432	20.71	26.66		
Crude Ore Entering Mill	315,559	79.29	46.60		
Concentrates Produced	152,464*	38.31	57.44	48.31	59.56
Heavy Density Rejects Scalped	41,370	10.40	38.45		
Tailings (by Deduction)	121,725	30.58	35.79		

\*Includes 2719 Tons Fines Concts.

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## 9. MAINTENANCE and REPAIRS

Because of long overdue repairs to shovels, the first four months of 1954 were spent in giving shovels a complete over-haul job. It is estimated that due to the completion of concurrent stripping, shovels in the future can be maintained in top operating condition during the operating season, thereby eliminating excessive Winter & Idle charges.

Truck and tractor repairs were also a large item of expense during these four months. Trucks to be sold had to be put in operating condition and painted. General overhaul had to be completed on trucks to be operated during ore operations. Here again, with an adequate supply of trucks, maintenance work can be done along with operations.

## 10. COST of OPERATIONS

### a. Comparative Mining Costs Hawkins-MacKilligan Combined

<u>Product</u>	<u>1954</u> <u>Estimate</u>	<u>1954</u> <u>Production</u>	<u>1953</u> <u>Production</u>
Wash Concentrates		64,681	214,979
Per Cent Recovery		51.99	54.32
Retreat Concentrates	600,000	381,590	589,615
Per Cent Recovery	<u>32.93</u>	<u>39.35</u>	<u>34.00</u>
	600,000	446,271	833,791
Overrun Stockpile		<u>11,593</u>	
Grand Total Production	<u>600,000</u>	<u>457,864</u> ✓	<u>833,791</u>
Average Daily Output		5,516	6,780
Tons per Man per Day		39.61	33.06
Days Operated		83	123
<u>Fine Ore Plant</u>			
Concentrates	100,000	100,996	78,164
Per Cent Recovery	45.00	44.41	52.06
Average Daily Output		918	878
Tons per Man per Day		29.38	26.25
Days Operated		110	89



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<u>Cost</u>	<u>1954 Estimate</u>	<u>1954 Production</u>	<u>1953 Production</u>
Total Pit Operating	\$0.291	\$0.266	\$0.276
Total Concentrating	0.165	0.165	0.187
Loading Stockpile Ore	0.020	0.012	0.023
Total General Mine Expense	0.336	0.309	0.227
Winter & Idle Expense	<u>0.938</u>	<u>1.024</u>	<u>0.601</u>
Cost of Production	<u>\$2.633</u>	<u>\$2.370</u>	<u>\$2.022</u>
<u>Depreciation</u>			
Plant and Equipment		0.208	0.233
Motorized and Other Equipment		0.034	0.041
Movable Equipment		0.008	0.010
<u>Amortization-Stripping</u>		-0.200	0.204
<u>Taxes</u>			
Ad Valorem		0.518	0.275
Occupational		0.127	0.028
Royalty		<u>0.167</u>	<u>0.072</u>
Total Depreciation, Amortization, Taxes		<u>\$0.862</u>	<u>\$0.863</u>
Administrative Expense		0.032	0.025
Miscellaneous Expense & Income		<u>0.015</u>	<u>-0.011</u>
Grand Total Cost at Mine		<u>\$3.279</u>	<u>\$2.900</u>

b. Detailed Cost Comparison

Pit operating costs were good in spite of the reduced work week. Truck operating charges were \$0.008, \$0.023 below the budget of \$0.031; truck maintenance charges were \$0.001, \$0.010 below the budget of \$0.011. Reductions were effected in operating and maintenance because of the purchase of 3 new trucks. All other charges were about normal.

Concentration costs were normal and compared favorably with the budget estimate and with 1953 costs. Total pit and concentrating showed a decrease due to a higher recovery than had been anticipated for this year. Drilling in the Hawkins and MacKillican for 1954 indicated a recovery of 32 per cent, although an actual recovery of 40 per cent was realized.

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General mine expense was increased because of a reduction in tonnage.

Cost of production and Winter & Idle costs were affected by:

1. Cutback in ore requirements.
2. Continuous operation of the Hawkins and MacKillican mines resulted in long overdue repair work to equipment; consequently, drills, shovels, trucks, tractors, graders, etc., were placed in the shop for a complete overhaul.
3. Although operating satisfactorily, the washing plant required drip pans, pickup pumps, and chute changes to cut down on maintenance and cleanup. Further, an oversupply of screen cloth and supplies resulted from a reduced season's operation.

With plant work completed and concurrent stripping discontinued, it is expected that repair work on shovels and trucks can be carried on during the operating season and thereby eliminate high Winter & Idle charges.

#### 11. EXPLORATION and FUTURE EXPLORATION

There was no exploratory drilling in 1954.

#### 12. TAXES

<u>Hawkins</u>	<u>1954</u>		<u>1953</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	\$562,623	\$168,066.74	\$642,705	\$168,536.53	-\$ 80,082	-\$ 469.79
Land,Bldg,Mach.	110,274	32,129.25	98,961	25,372.94	11,313	6,756.31
<u>Personal Property</u>						
Equipment	115,146	34,229.41	120,284	31,422.53	- 5,138	2,806.88
Stockpile	8,778	2,622.16	15,953	4,183.30	- 7,175	- 1,561.14
I.H.C.Basin Land	11,197	2,409.81	11,103	2,247.91	94	161.90
	<u>\$808,018</u>	<u>\$239,457.37</u>	<u>\$889,006</u>	<u>\$231,763.21</u>	<u>-\$ 80,988</u>	<u>\$ 7,694.16</u>
Average Mill Rate		296.35		260.70		/ 13.67

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I.H.C. Tailings Basin	1954		1953	
	Assessed Value	Taxes	Assessed Value	Taxes
Personal Property-Stockpile	\$54,314	\$11,689.46	\$50,517	\$10,227.67
Mill Rate		215.22		202.46

Tax Commission Reserve

<u>May 1</u>	1954	1953	Increase
	<u>Tons</u>	<u>Tons</u>	<u>Decrease</u>
Hawkins	5,879,394	6,286,900	-407,506
I.H.C.Tailings Basin	212,164	290,328	- 78,164

Tailings basin revalued by State from \$0.194 per ton in 1953 to \$0.2516 per ton in 1954. Taxes on this basin are paid direct by the International Harvester Company.

In the Village of Nashwauk and town of Lone Pine, all building values were increased by 25 per cent by order of the Commissioner of Taxation, State of Minnesota.

Concentrate stockpile on hand on May 1, 1953, totalled 57,323 tons; on May 1, 1954, 33,554 tons.

Per ton rate on mineral values is based on 47 per cent of full and true under recovery law.

13. ACCIDENTS and PERSONAL INJURY

<u>Name</u>	<u>Injury Date</u>	<u>Cause</u>	<u>Nature</u>	Weeks	<u>Compensation Paid</u>
				<u>Days Lost</u>	
John Vuyovich	1-7-54	While starting hydraulic oil pump with kerosene, a temporary wooden plug, put in when gauge broke off, blew off, explosion occurred and flames hit him in face.	1st and 2nd Degree burns on face.	3 Days	\$ 21.00

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<u>Name</u>	<u>Injury Date</u>	<u>Cause</u>	<u>Nature</u>	<u>Weeks Days Lost</u>	<u>Compensation Paid</u>
George Beasely	2-17-54	Fell about 4 feet from 5-foot ladder while working on conveyor scales, landing on left shoulder and back.	Multiple fracture of transverse process of lumbar vertebrae with comminuted fracture of left clavicle.	10 Weeks 2 Days	\$364.00
Kenneth McDermid	1-24-54	When shop caught fire, he jumped into truck to back it out; upon starting the motor, flames were sucked into cab, burning face and left hand.	First and second degree burns on face and left hand.	9 Weeks	\$329.00
Carl Forsberg	10-20-53	Caught finger between 2 pipes while inserting gasket in 2 pipelines	Index and middle fingers on left hand fractured.	None	\$408.33 (33% Disability)
Earl Barnes	6-17-54	In cleaning up plant dropped angle iron, striking right foot.	Fracture of proximal phalanx of big toe on right foot.	22 Weeks	\$784.00 (15% Disability)

14. PROPOSED NEW CONSTRUCTION

None at this time.

15. EQUIPMENT and PROPOSED NEW EQUIPMENT

a. Equipment Received

3 Euclid 34-ton FFD Rear Dump Trucks on Rental Basis  
2 Euclid 34-ton Used Trucks-Transfer from Hill-Trumbull

b. Proposed New Equipment

1 Loader to replace present Lull loader.  
2 Pickup trucks for replacement.

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Upon completion of the 1953 fall stripping program on December 31, 1953, mine activity was confined to dyke construction and to pit and plant repair.

Dyke work was started January 4 and completed January 26. In 1952, about one-third of the length of the new dyke was completed to the full width; the remaining distance was narrowed to make the dyke useable for the 1953 season. Dyke work in January consisted of widening the new dyke, raising the dyke six feet, and filling the erosion channel in the dyke between the old and the new basins. One shovel and three trucks, working on a 3-shift, 5-day-week basis, hauled 76,827 cubic yards of fill.

An extensive repair and maintenance program was also conducted: Repairs were made to pit conveyors, screen plant, and timbering of the pit conveying tunnel; mine shops repaired shovels, drills, haulage cars, and miscellaneous equipment; and the truck shop repaired trucks, tractors, and graders.

General repairs in the washing, retreat, and cyclone plants, begun in the fall of 1953, continued through the winter and spring. Revision and installation of the conveying system, needed for the two dewatering classifiers moved into the basement of the cyclone plant, were completed for the 1954 ore season. A total of 1200 feet of 16-inch pipe was extended from the end of the present discharge to the new basin.

Stockpiles were completely loaded out in the fall of 1953; no stockpile loading was necessary in the spring of 1954.

Pit cleanup started during the week of April 26 with one shovel and five trucks working on a single shift, intermittent basis because of unfavorable weather conditions. A total of 5112 cubic yards of cleanup was moved along the Trumbull road leading to the Hill-Walker pit.

Due to adverse weather conditions, ore production, originally scheduled for Monday, May 3, was postponed until Thursday, May 6. A 2-shift, 5-day-week schedule continued until July 12 when all operations remained on a 2-shift, 4-day-week basis until the end of ore operations on September 30.

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Two to three shovels in ore, serviced by eight to ten trucks, produced 1,371,703 tons of crude wash and retreat ore which yielded 393,822 tons of concentrates. Shift production of crude averaged 7,375 tons with a recovery of 28.71, 4.22 per cent below the 1953 recovery of 32.93 per cent.

Wash ore was mined mainly from the Trumbull-Delaware #2 trespass area with a very minor amount from the Hill lease. From 83,062 tons of crude, 47,042 tons of concentrates were produced. Shift production of washed concentrates averaged 3,421 tons at a recovery of 56.63 per cent.

A total of 1,288,641 tons of retreat crude was mined from the following areas:

1. West, north, and east sides of the Hill-Walker.
2. North side of the Hill and scam area.
3. West Trumbull:
  - a. Area leading to Potter.
  - b. Slough area on the south side.
  - c. Southeast corner.
4. Southeast side of the Potter.

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

<u>Property</u>	<u>Material</u>	<u>Tons Produced</u>	<u>Tons Concentrates Yielded</u>
Hill-Walker	Retreat Crude	540,439	152,668
Hill	Retreat & Scram	378,335	101,617
Trumbull	Retreat Crude	340,654	86,354
Potter	Crude	<u>29,213</u>	<u>6,141</u>
		<u>1,288,641</u>	<u>346,780</u>

Shift production of retreat concentrates averaged 2,014 tons at a net recovery averaging 26.91 per cent.

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A railroad car shortage necessitated the stockpiling of 173,801 tons of concentrates during the season.

Following the close of mining operations, plant and conveyor systems were cleaned out and crews shifted to stripping. After the plants were washed out, they were tied up and no plant repairs were scheduled until February 15, 1955.

The stripping program involved the removal of surface from the west and north sides of the Hill-Walker and from the north side of the Trumbull to expose ore along the south line of the Hill-Walker.

Stockpile loading was begun after the shutdown of mining operations and continued intermittently as cars were available until October 14 with 20,066 tons loaded out during this period. A total of 84,762 tons of concentrates was loaded out during the year. A balance of 89,039 tons of concentrates was left in the stockpile at the end of the season.

## 2. PRODUCTION, SHIPMENTS and INVENTORIES

### a. Production by Grades

<u>Crude</u>	<u>Tons</u>
Hill Line	1,844
Hill Retreat	323,045
Trumbull Line	80,648
Trumbull Retreat	290,614
Hill-Walker Retreat	467,764
Potter Retreat	<u>20,393</u>
	1,184,308

<u>Concentrates</u>	<u>Bessemer</u>	<u>Non Bessemer</u>	<u>Total</u>
Hill Line		1,042	1,042
Hill Retreat	75,959	25,658	101,617
Trumbull Line	15,983	30,017	46,000
Trumbull Retreat	23,402	62,952	86,354
Potter Retreat		6,141	6,141
Hill-Walker Retreat	<u>12,033</u>	<u>140,635</u>	<u>152,668</u>
	127,377	266,445	393,822

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b. Shipments

<u>Concentrates</u>	<u>Bessemer</u>	<u>Non Bessemer</u>	<u>Total</u>
Hill Retreat	75,959	7,986	83,945
Trumbull Line	15,983	4,718	20,701
Trumbull Retreat	23,402	29,582	52,984
Potter Retreat		6,141	6,141
Hill-Walker Retreat	<u>12,033</u>	<u>128,979</u>	<u>141,012</u>
	<u>127,377</u>	<u>177,406</u>	<u>304,783</u>

c. Stockpile Inventories

<u>Property</u>	<u>Line</u>	<u>Retreat</u>	<u>Total</u>
Hill	1,042	17,672	18,714
Trumbull	25,299	33,370	58,669
Hill-Walker		<u>11,656</u>	<u>11,656</u>
	<u>26,341</u>	<u>62,698</u>	<u>89,039</u>

d. Production by Months

Month	<u>Crude</u>						<u>Total</u>
	<u>Hill</u>		<u>Trumbull</u>		<u>Hill-Walker</u>	<u>Potter</u>	
	<u>Line</u>	<u>Retreat</u>	<u>Line</u>	<u>Retreat</u>	<u>Retreat</u>	<u>Retreat</u>	
May					210,569		210,569
June		24,637			257,195		281,832
July	1,844	248,813					250,657
Aug		49,595	52,279	122,113			223,987
Sept			<u>28,369</u>	<u>168,501</u>		<u>20,393</u>	<u>217,263</u>
	<u>1,844</u>	<u>323,045</u>	<u>80,648</u>	<u>290,614</u>	<u>467,764</u>	<u>20,393</u>	<u>1,184,308</u>
<u>Concentrates</u>							
May					65,582		65,582
June		7,781			87,086		94,867
July	1,042	79,559					80,601
Aug		14,277	30,547	35,508			80,332
Sept			15,453	50,847		5,700	72,000
Oct				-1		<u>441</u>	<u>440</u>
	<u>1,042</u>	<u>101,617</u>	<u>46,000</u>	<u>86,354</u>	<u>152,668</u>	<u>6,141</u>	<u>393,822</u>



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### 3. ANALYSIS

#### a. Crude Ore

<u>Product</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>
Hill Line	1,844	38.40	.032	39.70
Hill Retreat	323,045	36.18	.028	45.16
Trumbull Line	80,648	41.31	.035	35.02
Trumbull Retreat	290,614	37.18	.032	41.71
Hill-Walker Retreat	467,764	40.21	.041	38.38
Potter Retreat	20,393	38.55	.035	40.61
	1,184,308	38.40	.035	40.86

#### b. Tonnage and Analysis of Concentrates Produced

<u>Product</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mn</u>	<u>Alum</u>	<u>Moisture</u>
Hill Non Bessemer Line	✓ 1,042	58.58	.038	13.88	.16	.40	6.40
Hill Bessemer Retreat	75,959	59.14	.040	11.08	.17	.39	7.03
Hill Non Bessemer Retreat	✓ 25,658	59.39	.043	10.62	.17	.41	7.07
Trumbull Bessemer Line	15,983	58.99	.043	7.69	.17	.38	9.58
Trumbull Non Bessemer Line	✓ 30,017	58.32	.044	8.61	.19	.43	9.97
Trumbull Bessemer Retreat	23,402	57.94	.048	9.96	.17	.46	6.70
Trumbull Non Bessemer Retreat	✓ 62,952	57.72	.052	9.80	.16	.45	6.85
Hill Bessemer Walker Retreat	12,033	58.99	.052	11.23	.18	1.02	9.30
Hill Non Bessemer Walker Retreat	✓ 140,635	59.20	.055	10.56	.16	.93	8.71
Potter Non Bessemer Retreat	✓ 6,141	56.03	.050	13.90	.13	.33	6.23
	393,822	58.76	.049	10.32	.16	.62	7.97

Non Besse

266,445

Besse

127,377

393,822

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c. Tonnage and Complete Analysis of Concentrates Shipped

<u>Product</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mn</u>	<u>Alum</u>	<u>Lime</u>	<u>Mag</u>	<u>Sulf</u>	<u>Ign</u> <u>Loss</u>	<u>Moist</u>
Hill Bessemer Retreat	75,959	59.14	.040	11.08	.17	.39	.10	.15	.007	3.38	7.03
Hill Non Bessemer Retreat	7,986	59.59	.051	10.48	.17	.47	.10	.15	.007	3.23	7.22
Trumbull Bessemer Line	15,983	58.99	.043	7.69	.17	.38	.10	.15	.007	6.98	9.58
Trumbull Non Bessemer Line	4,718	57.44	.045	10.08	.15	.47	.10	.15	.007	6.75	9.27
Trumbull Bessemer Retreat	23,402	57.94	.048	9.96	.17	.46	.10	.15	.007	6.13	6.70
Trumbull Non Bessemer Retreat	29,582	57.81	.052	9.84	.18	.43	.10	.15	.007	6.44	6.62
Hill-Walker Bessemer Retreat	12,033	58.99	.052	11.23	.18	1.02	.10	.15	.007	2.77	9.30
Hill-Walker Non Bessemer Retreat	128,979	59.20	.055	10.55	.16	.92	.10	.15	.007	3.27	8.67
Potter Non Bessemer Retreat	6,141	56.03	.050	13.90	.13	.33	.10	.15	.007	5.10	6.23
	<u>304,783</u>	<u>58.85</u>	<u>.049</u>	<u>10.50</u>	<u>.16</u>	<u>.65</u>	<u>.10</u>	<u>.15</u>	<u>.007</u>	<u>4.11</u>	<u>7.90</u>

d. Mine Analysis of Ore in Stockpile

<u>Material</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>	<u>Moisture</u>
Hill Line	1,042	58.58	.038	13.88	.16	.40	6.40
Hill Retreat	17,672	59.30	.040	10.68	.17	.39	7.01
Trumbull Line	25,299	58.48	.044	8.33	.20	.42	10.10
Trumbull Retreat	33,370	57.64	.052	9.76	.15	.47	7.06
Hill-Walker Retreat	11,656	59.25	.054	10.70	.17	.95	9.21
	<u>89,039</u>	<u>58.43</u>	<u>.047</u>	<u>9.71</u>	<u>.17</u>	<u>.50</u>	<u>8.19</u>

4. ESTIMATE of ORE RESERVES

a. Developed Ore - Factors Used

<u>Concentrates</u>	<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	60.00
Lean Wash	14	0	48.00
Low Grade Wash	14	0	57.00
Lean Low Grade Wash	14	0	45.00
Retreat	14	0	36.00
Hill-Walker Wash	14	0	59.00
Hill-Walker Retreat	14	0	33.00
Potter Retreat	14	0	28.00

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b. Ore Reserves Estimated as of December 31, 1954

<u>Lease</u>	<u>Reserve 12-31-53</u>	<u>Mined 1954</u>	<u>Balance After Mining</u>	<u>Changed by Re-estimate</u>	<u>Reserve 12-31-54</u>
Trumbull	1,353,664	132,354	1,221,310	<del>4</del> 35,197	1,656,507
Hill	1,121,073	102,659	1,018,414		1,018,414
Hill-Walker	906,738	152,668	754,070		754,070
Potter		<u>6,141</u>	<u>- 6,141</u>	<del>1</del> 03,776	<u>97,635</u>
	<u>3,381,475</u>	<u>393,822</u>	<u>2,987,653</u>	<del>7</del> 538,973	<u>3,526,626</u>

c. Estimated Analyses of Ore Reserves

	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>
<u>Hill</u>						
Non Bessemer Direct	120,805	59.27	.064	10.50		
Bessemer Wash Concentrate	491,729	61.16	.028	10.60	.10	.47
Non Bessemer Wash Conct.	455,265	58.87	.055	11.42	.11	.50
Bessemer Retreat Conct.	329,186	58.30	.030	11.98		
Non Bessemer Retreat Conct.	<u>2,129,641</u>	<u>56.32</u>	<u>.056</u>	<u>12.63</u>		
	<u>3,526,626</u>	<u>57.61</u>	<u>.050</u>	<u>12.06</u>	<u>.10</u>	<u>.48</u>
<u>Trumbull</u>						
Bessemer Wash Conct.	51,377	58.16	.035	9.19	.14	.42
Non Bessemer Wash Conct.	252,163	57.85	.056	11.67	.11	.51
Bessemer Retreat Conct.	104,026	56.79	.032	11.58		
Non Bessemer Retreat Conct.	<u>1,248,941</u>	<u>56.35</u>	<u>.058</u>	<u>12.29</u>		
	<u>1,656,507</u>	<u>56.97</u>	<u>.055</u>	<u>12.05</u>	<u>.11</u>	<u>.49</u>
<u>Hill-Walker</u>						
Non Bessemer Wash Conct.	60,053	59.50	.045	11.30		
Non Bessemer Retreat Conct.	<u>694,017</u>	<u>55.95</u>	<u>.051</u>	<u>13.27</u>		
	<u>754,070</u>	<u>56.23</u>	<u>.051</u>	<u>13.11</u>		
<u>Potter</u>						
Non Bessemer Retreat Conct.	97,635	56.62	.060	12.85		
<u>Total Direct</u>						
	120,805	59.27	.064	10.50		

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	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>
Bessemer Wash Concts.	491,729	61.16	.028	10.60	.10	.47
Non Bessemer Wash Concts.	<u>455,265</u>	<u>58.87</u>	<u>.055</u>	<u>11.42</u>	<u>.11</u>	<u>.50</u>
<u>Total Wash Concentrates</u>	946,994	60.06	.041	10.99	.10	.48
Bessemer Retreat Concts.	329,186	58.30	.030	11.98		
Non Bessemer Retreat Concts.	<u>2,129,641</u>	<u>56.32</u>	<u>.056</u>	<u>12.63</u>		
<u>Total Retreat Concentrates</u>	2,458,827	56.59	.053	12.54		
Total Bessemer Concts.	820,915	60.01	.029	11.15	.10	.47
Total Non Bessemer Concts.	<u>2,584,906</u>	<u>56.77</u>	<u>.056</u>	<u>12.42</u>	<u>.11</u>	<u>.50</u>
<u>Total Hill-Trumbull</u>	3,405,821	57.55	.049	12.11	.11	.49

## 5. LABOR and WAGES

### a. Comments

An ample labor supply prevailed in 1954 because fewer men were called back during the season than were required in 1953.

A wage increase of \$0.05 per hour was granted on July 1, 1954.

Company and Union relations were normal.

### b. Comparative Statement of Production and Wages

Product	393,822
Number of 8-hour shifts.	2
Average number of men working.	168
Average wages per day.	\$19.16
Product per man per day.	29.34
Labor cost per ton.	\$0.748
Total number of days worked.	93
Amount paid for labor	\$294,877.87

## 6. GENERAL SURFACE

### a. Building and Repairs

Houses and other buildings were repaired and painted as required.

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b. Roads, Transmission Lines, Tracks, and Construction

No major changes were made during the year to either roads or transmission lines.

Normal track repair was carried on throughout the ore season. An extensive repair job to the washing plant bridge was completed. Because the Highway Department might widen the present highway, only minor repairs were made to the bridge over Highway 169. ✓

Revision and installation of the conveying system, needed for the two dewatering classifiers moved into the basement of the cyclone plant, were completed.

A repair program in the pit tunnel, consisting of blocking up loose sides, installing 37 lining sets and extra props where necessary, was carried on in the spring. ✓

7. OPEN PIT

a. Stripping

No stripping was in progress at the start of the 1954 season.

Cleanup of a small amount of surface from the north bank of the Trumbull was begun and consisted of cleanup of the bank slough along the road leading to the Hill-Walker pit. This work was completed on April 29 with a total of 5,112 cubic yards moved.

Following the close of mining operations in September, three shovels--one used as a standby--were moved to the Hill-Walker to strip from the Trumbull and Hill-Walker leases. Four crews worked on a 32-hour, 16-shifts-per-week schedule stripping from the north and west sides to expose ore of the proper grade for the 1955 season and from the north side of the Trumbull dump to release Hill-Walker ore to the south property line. Using two shovels and nine to ten trucks, stripping was dumped on lands immediately north of the Hill-Walker pit area. Stripping was completed on October 16 with a total of 198,815 cubic yards stripped, of which 88,941 cubic yards came from the Trumbull and 109,874 from the Hill-Walker.

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Shift production averaged 6,213 cubic yards at an average cost of \$0.188 per yard, about \$0.102 under the budget.

Following completion of stripping, all shovels were readied for general repairs to start in March of 1955.

Stripping material moved in 1954 is as follows:

<u>Lease</u>	<u>Cubic Yards Surface</u>	<u>Cubic Yards Waste</u>	<u>Cubic Yards Total</u>
Trumbull	88,941		88,941
Hill-Walker	<u>109,874</u>		<u>109,874</u>
	198,815		198,815

b. Open Pit Mining

On May 6, the 1954 ore season was opened on a 2-shift, 5-day-week schedule which was maintained until July 12 when operations were reduced to a 2-shift, 4-day-week schedule and continued thus until the end of ore season on September 30.

Operating two to three shovels and eight to ten trucks under normal operations, a total of 1,371,703 tons of crude ore was produced in 93 days at an average shift production of 7,375 tons. From the crude tonnage, 187,395 tons of plus 4-inch waste rock was screened out in the pit; the balance of 1,184,308 tons was sent to the plants at an average rate of 6,367 tons per shift.

Screen rock constituted 13.66 per cent of the total crude, 0.69 per cent of the wash crude, and 14.50 per cent of the retreat. Rock percentage in the wash ore decreased 0.38 per cent below the previous year; rock percentage in the retreat increased 1.59 per cent over last year; the combined total increased 1.29 per cent over the 1953 season. A progressive increase in the amount of screened rock handled has been shown in the past several years.

As in the past several years, retreat ore constituted the major portion of the pit production, totalling 1,288,641 tons, as compared with 83,062 tons of washed crude ore.

Following is the tonnage produced from the various leases:

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<u>Lease</u>	<u>Tons Retreat Crude</u>	<u>Area from Which Produced</u>
Hill-Trumbull	540,439	By enlarging pit to the west, north, and east.
Hill	378,335	North side and scam area.
Trumbull	340,654	Area leading to Potter; slough area on south; southeast corner.
Potter	<u>29,213</u>	Southeast side.
	1,288,641	

Wash ore was produced from the Trumbull-Delaware No. 2 trespass and a small tonnage from the north side of the Hill lease.

During mining operations, rock too large to pass through the screening plant was sorted and loaded out at the shovel. This pit rock amounted to 63,480 tons which, combined with 10,620 yards, or 15,930 tons, of sand and waste cleanup, gave a total of 79,410 tons of waste material removed from the mine during the operating season at an average cost of \$0.007 per ton of crude ore moved.

Mining conditions during the 1954 operating season were generally satisfactory and normal, with a few heavy rains and average equipment breakdowns.

c. Pumping and Drainage

Pit pumping was increased over the previous season as the bottom of the Trumbull was worked. The Oliver Iron Mining Division did not work the Delaware No. 2 lease, so the Hill-Trumbull had to do most of the pumping to make ore available. Pumping and drainage cost was \$0.005 per ton of crude ore.

A weir box was constructed north of Mud Lake to clarify both pit water and drainage from the dump area.

Water was still pumped from the lower ditch to the upper ditch in the Hill-Walker pit area.

d. General Pit Acitivity

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

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## 8. BENEFICIATION

### a. Washing Plant

Operation of the washing plant was scheduled to start May 3 but was delayed until May 6 by inclement weather. A 2-shift, 5-day-per-week schedule continued until July 12 when a 4-day week was instituted and maintained until the end of ore season on the 30th of September. During the season's operation, the washing plant operated a total of 186 shifts, treating 1,184,308 tons of crude ore; of this total, 82,492 tons were wash crude and 1,101,816 tons were retreat crude. The plant produced 47,042 tons of washed concentrates and 513,865 tons of Heavy-Media feed. Recovery of washed concentrates was approximately 57.03 per cent and Heavy-Media feed amounted to 11.11 per cent of the retreat crude ore, accounting for the slight decrease in recovery of Heavy-Media feed over the 1953 season, which was 47.85 per cent. The crude feed rate averaged 829.41 tons per hour to the washing plant, reflecting a slight increase over that of the previous season.

Washing plant delays amounted to 4.07 per cent of the total operating time, representing an important decrease from the previous season of 7.79 per cent. As in the past, by far the major part of the total delay time was attributed to lack of crude ore at the mill. Delays attributed to mechanical difficulties were down slightly for the season, reflecting in some measure the ability to make minor repairs more promptly with the 2-shift schedule in effect.

Following is a brief summary of delay time:

<u>Source of Delay</u>	<u>Hours</u>	<u>Per Cent</u>	<u>Per Cent of 1488.5 Working Hours</u>
Out of Ore	42.81	70.63	2.88
8' Pan Feeder	1.59	2.63	0.10
Crude Conveyor	0.50	0.82	0.03
Primary Screens	1.53	2.52	0.10
Scalp Rock Conveyor	0.50	0.82	0.03
Crushers	0.25	0.41	0.02
Crusher Product Screens	1.00	1.65	0.07



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<u>Source of Delay</u>	<u>Hours</u>	<u>Per Cent</u>	<u>Per Cent of 1488.5 Working Hours</u>
Secondary Screens	0.42	0.69	0.03
Surge Pile Feed Belt	0.83	1.37	0.06
Surge Pile Full	0.33	0.54	0.02
Cyclone Plant Feed Bins Full	2.00	3.30	0.13
Waiting for Rock Truck	2.84	4.70	0.19
Tailings Pump	1.42	2.34	0.10
Tailings Line	0.50	0.82	0.03
Electric Power	3.00	4.96	0.20
Misc. Chutes & Launderers	<u>1.09</u>	<u>1.80</u>	<u>0.07</u>
	60.61	100.00	4.07

Recapitulation

Crude Ore Delays (Ore to Head of Mill)	44.90	74.08	3.02
Ore Processing Delays	<u>15.71</u>	<u>25.92</u>	<u>1.05</u>
	60.61	100.00	4.07

b. Retreat Plant

Retreat plant operation began on May 6 and followed the same schedule as that of the washing plant and pit. During periods when the washing plant was down for repairs or processing wash ore crude, the retreat plant operated on feed from the surge pile. 513,865 tons of Heavy-Media feed produced 275,398 tons concentrates at a weight recovery of 53.59 per cent. A total of 1,101,816 tons of retreat crude delivered to the washing plant produced 346,780 tons of concentrates at a weight recovery of 31.48 per cent.

The over-all grade of Heavy-Media concentrates was considerably better than that produced during the previous season. Over one per cent reduction in silica was effected. Since the crude grade was very nearly the same as last year, the improvement in concentrate grade must, in large measure, be attributed to the finer crushing practiced throughout the season, coupled with increased scalping of the lean  $\frac{1}{2}$  inch material, and more efficient operation of the cyclone treatment of the fines.

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Retreat plant delays were calculated on a somewhat different basis this year, as downtime resulting from the processing of wash ore by the washing plant was not considered as an actual delay. This time was simply subtracted from the total hours of time which the washing plant worked and hence does not show a percentage basis. Delay time then was calculated on the basis of hours not worked out of all those possible only during the times that the washing plant was actually processing retreat feed or retreat feed was available from the surge pile.

Failure of the feed preparation screen mechanism accounted for the largest part of the total delay time, with out-of-ore being the next most serious delay.

<u>Source of Delay</u>	<u>Hours</u>	<u>Per Cent</u>	<u>Per Cent of 1460.67 Working Hours</u>
Out of Ore	8.25	13.31	0.56
Surge Pile Feeder	0.33	0.53	0.02
Feed Preparation Screen	40.83	65.86	2.79
Circulating Media Pumps	6.50	10.48	0.45
Coarse Concentrating Wash Screens	0.67	1.08	0.05
Fine Concentrating Wash Screens	0.75	1.21	0.05
Waiting for Rock Truck	2.17	3.50	0.15
Electric Power	<u>2.50</u>	<u>4.03</u>	<u>0.17</u>
	62.00	100.00	4.24
<u>Recapitulation</u>			
Crude Ore Delays (Ore to Head of Mill)	8.58	13.84	0.58
Ore Processing Delays	<u>53.42</u>	<u>86.16</u>	<u>3.66</u>
	62.00	100.00	4.24

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

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Washing Plant

<u>Product</u>	<u>Tonnage</u>	<u>Per Cent</u>		<u>Recovery</u>	
		<u>Total Mined</u>	<u>Iron Dried</u>	<u>Tonnage</u>	<u>Iron Unit</u>
Crude Ore & Rock Mined	83,332	100.00	41.08		
Less Rock Removed in Mining	270	0.32	25.40		
Crude Ore Transfer to Screen Plant	83,062	99.68	41.13		
Less Rock Rejects in Screen Plant	570	0.69	24.58		
Crude Ore Entering Mill	82,492	98.99	41.24		
Concentrates Produced	47,042	56.45	58.55	57.03	80.96
Tailings (by Deduction)	35,450	42.54	18.27		

Retreat Plant

Crude Ore & Rock Mined	1,352,121	100.00	35.86		
Less Rock Removed in Mining	63,480	4.69	26.06		
Crude Ore Transfer to Screen Plant	1,288,641	95.31	36.34		
Less Rock Rejects in Screen Plant	186,825	13.82	25.41		
Crude Ore Entering Mill	1,101,816	81.49	38.20		
Concentrates Produced	346,780	25.65	58.79	31.47	48.44
Heavy Density Rejects	238,467	17.64	29.48		
42" Wash Product Rejects Scalped	122,360	9.05	28.08		
Tailings (by Deduction)	394,209	29.15	28.50		

c. Cyclone Plant

The cyclone plant began operations on May 6 on the same work schedule as the washing and retreat plants. Although at the outset there were still some minor mechanical difficulties to overcome, operation continued much more smoothly than the previous season, due primarily to the new conveying system installed for the transportation of concentrates and rejects and due to the increased cyclone capacity. On a calculated basis, 119,083 tons of cyclone feed produced 79,490 tons of concentrates at a weight recovery of 66.75 per cent. Recovery was down somewhat over last year, but this was coincidental with an improved grade of concentrate. Some bypassing of cyclone

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feed was still necessary when the crude ore contained an unusually high percentage of fines because during these periods capacity of the plant was exceeded. This amount of bypass time was substantially reduced over the past season despite the increased feed rate to the washing plant.

Contemplated changes to be made in the cyclone plant this spring, which include more cyclone and magnetic separator capacity, should result in an even smoother operation for the next year and one which should be capable of handling an increased tonnage of cyclone feed.

#### 9. MAINTENANCE and REPAIRS

The usual winter repair program in progress at the start of the year was continued until ore season. Following completion of stripping, all shovels were moved to the stripping garage for general repair, and all other equipment was brought to the shop for inspection and repair. Normal repairs were conducted at the pit screen plant and conveyor system.

Following the close of the 1954 ore season, all plants were cleaned out and shut down. The winter repair program will not start until February 15, 1955. After the stripping program, all trucks were blocked up for storage and tires were removed and sent in for repairs. The shops were drained and closed for the winter. Equipment repairs will start approximately March 1, 1955.

#### 10. COST of OPERATION

##### a. Comparative Mining Costs

<u>Product</u>	<u>1954 Budget</u>	<u>1954 Year</u>	<u>1953 Year</u>
Direct Shipping Ore			
Washing Plant Concentrates	20,000	47,042	54,501
Retreat Concentrates	<u>385,000</u>	<u>346,780</u>	<u>597,377</u>
Total Production	405,000	393,822	651,878
Recovery	30.68	28.71	33.99
Average Daily Output		4,236	6,146
Tons Per Man Per Day		29.34	24.93
Days Operated		93	104

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<u>Cost</u>	<u>1954 Budget</u>	<u>1954 Year</u>	<u>1953 Year</u>
Pit Operating	\$ .352	\$ .283	\$ .280
Concentrating	.268	.225	.247
Loading Stockpile Ore	.025	.014	.028
General Mine Expense	.369	.434	.257
Winter & Idle	<u>1.040</u>	<u>1.119</u>	<u>.707</u>
Cost of Production	<u>\$3.454</u>	<u>\$3.337</u>	<u>\$2.542</u>
<u>Depreciation</u>			
Plant and Equipment		.114	.097
Motorized Equipment		.103	.086
Movable Equipment		.007	.005
<u>Amortization</u>			
Defense Facilities		.290	.153
Stripping		.000	.000
<u>Taxes</u>			
Ad Valorem		.248	.143
Occupational		.119	.113
Royalty		<u>.163</u>	<u>.142</u>
Total: Depreciation, Amortization, Taxes		\$1.044	\$0.739
Administrative Expense		.100	.100
Miscellaneous Expense and Income		<u>.011</u>	<u>.003</u>
Total Cost at Mine		\$4.492	\$3.384

Cost figures are taken from the mine cost sheet through December before revision by the Cleveland office.

b. Detailed Cost Comparison

Pit operating cost was \$0.069 below the budget and \$0.003 over 1953 costs. Cost of drilling and blasting was \$0.013 below the budget and \$0.013 under 1953 costs due to an increased amount of sluff material and wash ore mined along the south line of the Trumbull lease. Truck maintenance was \$0.012 under the budget and \$0.010 under 1953 costs because of the addition of new rented trucks to the fleet. Three additional rental trucks increased costs \$0.038 over 1953 costs. Labor costs compared favorably with 1953 costs.

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Concentrating costs were \$0.043 under the budget and \$0.022 under 1953 costs. In 1953, dyke work cost \$0.023. No dyke work was needed in 1954; but had we done the same amount of dyke work in 1954, the costs would have been almost identical. All items were less than the budget because of an increased amount of crude put through the plants. The increase was possible because the crude was not as wet and painty as in 1953.

Because less ore was loaded out than anticipated, the cost of loading stockpile ore was \$0.011 under the budget and \$0.014 1953 costs.

General mine expense was \$0.065 over the budget and \$0.177 over 1953 costs. All items under this caption were affected by the reduced tonnage and cutback of forces at a later date than originally anticipated.

Winter & Idle expense was \$0.079 over the budget and \$0.412 over 1953 costs. The large amount of repair work needed to start the ore season of lesser tonnage than anticipated raised the costs considerably.

Cost of production was \$0.117 lower than the budget and \$0.795 over 1953 costs. A reduction of 5.28 per cent in recovery from the 1953 season and a large reduction in tonnage increased the costs over 1953 costs.

#### 11. EXPLORATION and FUTURE EXPLORATION

The 1954 drilling program was discontinued and no drilling is anticipated for 1955.

Further drilling will be needed in each of the present leases, but the need is not dire with the present economic conditions. Some additional holes will be needed to further prove or disprove ore beneath the present pit bottom in the Hill pit. Further exploration is required on the north bank of the Hill lease between the Hill pit and the Barbara. Most of this area has been drilled on 300-foot centers and indicates some ore.

A few more holes are required along the north bank of the Trumbull to determine actual mining limits. With only the eastern half of the forty having been drilled to any extent, the Potter lease required more exploration. Hill-Walker drilling is fairly complete, although some holes should be drilled along the south line to determine final limits.

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## 12. TAXES

Hill-Trumbull	1954		1953		Increase Decrease	
	Assessed Value	Taxes	Assessed Value	Taxes	Assessed Value	Taxes
Mineral	\$234,144	\$39,366.63	\$294,409	\$47,876.79	-\$60,265	-\$8,510.16
Land, Bldg. Mach.	141,989	30,719.26	129,871	27,389.50	12,118	3,329.76
<u>Personal Property</u>						
Equipment	141,655	23,848.22	140,376	22,860.31	1,279	987.91
Stockpile	2,309	388.21	4,881	793.75	- 2,572	- 405.54
Total	\$520,097	\$94,322.32	\$569,537	\$98,920.35	-\$49,440	-\$4,598.03
Avg. Mill Rate		181.36		173.69		4.42%

Assessed values of buildings in Calumet increased 25 per cent; in Marble 20 per cent; by order of Commissioner of Taxation, State of Minnesota. Mineral values decreased from 35 per cent full and true to 30 per cent full and true under recovery law.

### Tax Commission Reserve

May 1

1954	1953	Increase
<u>Tons</u>	<u>Tons</u>	<u>Decrease</u>
3,485,251	3,907,925	-422,674

Tonnage Reduction in reserve by amount mined 5-1-53 to 5-1-54	614,434
Reserve increased by additional on Potter	103,776
Reserve increased by additional on Trumbull	87,984
Total	-422,674

## 13. ACCIDENTS and PERSONAL INJURY

<u>Name</u>	<u>Date of Injury</u>	<u>Cause</u>	<u>Nature of Injury</u>	<u>Days Lost</u>	<u>Compen- sation</u>
Jerome Vanoverschelde	2-16-54	Twisted right shoulder in- stalling walk- ways & railways on conveyors	Strained upper right deltoid muscles	3	\$21

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<u>Name</u>	<u>Date of Injury</u>	<u>Cause</u>	<u>Nature of Injury</u>	<u>Days Lost</u>	<u>Compensation</u>
Vincent J. Soleture	5-8-54	Slipped and caught hand in V-belt while taking guard off and unplugging pump in basement of plant.	Compound fracture proximal joint, ring finger, left hand.	3	\$371 40% Permanent Disability

14. PROPOSED NEW CONSTRUCTION

Increasing magnetic separator capacity in cyclone plant by additional 21 lineal feet.

Providing automatic fire protection in pit tunnel.

Extension of rock reject belt at mill will be made as needed.

15. EQUIPMENT RECEIVED and PROPOSED NEW EQUIPMENT

a. New Equipment Received

1. Hough Model HF Payloader  
1 1-1/2 Ton Coffing Hoist  
1 4-Inch Carver Pump  
1 5-Ton Aerol Lift Pump  
2 Sets 4 Wheels with Axles for Locomotives  
1 Magnetic Separator Drum  
1 Switchboard Panel  
1 37-1/2 KVA Transformer

11,933 Feet #2 Bare Copper Wire  
29 Lengths 16-Inch Spiral Pipe  
28 30-Inch Troughing Idlers

716 Feet 24" Conveyor Belting  
220 Feet 30" Conveyor Belting  
1257 Feet 36" Conveyor Belting (Repaired)

1 7-1/2 hp Motor  
2 10 hp Motors  
1 5 hp Motor



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b. Proposed New Equipment

- 1 Caterpillar Patrol
- 2 Jeffrey Magnetic Separators
- 2 Dings Magnetic Separators
- 2 Ingersoll-Rand Impact Wrenches
- 1 Automatic Fire Protection for Pit Tunnel
- 2 Side Plates for 6'x7' Screen
- 1 Pickup Truck

Additional Cyclones

- 20 Feet 30" Conveyor Belting

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Usual Winter & Idle repairs to pit and plant equipment continued until April 30 on a 40-hour-per-week schedule. Stockpile concentrate loading started on April 19 and continued intermittently throughout the year. Structure drilling by the Henry Schultze Company continued to the end of May. Pit and plant operations were carried on from May 6 until September 30. Stripping was done intermittently on the third shift in conjunction with pit cleanup until the end of ore season on November 20. The mine was on a standby basis from November 20 until the end of the year.

Minor power line changes were made during the year. A baffle dyke to clarify water was constructed in the tailings basin during April. A new sump was excavated for pit drainage and a new one-stage automatic pumping facility was installed in October.

Operations during the year were good and no serious delays were encountered.

2. PRODUCTION - INVENTORIES - SHIPMENTSa. Production by Grades

	<u>Crude</u>	<u>Wash</u>	<u>Retreat</u>	<u>Total</u>	
Holman		21,871	193,506	215,377	
Brown		5,910	694,727	700,637	
North Star		<u>57,830</u>	<u>86,764</u>	<u>144,594</u>	
		85,611	974,997	1,060,608	
<u>Concentrate</u>	<u>Bessemer</u>		<u>Non Bessemer</u>		<u>Total</u>
	<u>Wash</u>	<u>Retreat</u>	<u>Wash</u>	<u>Retreat</u>	
Holman	9,204	62,746	3,486	41,246	116,682
North Star	5,912	18,222	37,306	28,058	89,498
Brown	<u>372</u>	<u>182,916</u>	<u>3,246</u>	<u>165,331</u>	<u>351,865</u>
	15,488	263,884	44,038	234,635	558,045

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b. Shipments

<u>Concentrates</u>	<u>Bessemer</u>		<u>Non Bessemer</u>		<u>Total</u>
	<u>Wash</u>	<u>Retreat</u>	<u>Wash</u>	<u>Retreat</u>	
Holman	9,204	98,460	6,895	78,001	192,560
Brown	372	220,832	2,835	186,405	410,444
North Star	<u>5,912</u>	<u>18,222</u>	<u>37,306</u>	<u>14,901</u>	<u>76,341</u>
	15,488	337,514	47,036	279,307	679,345

c. Inventories

<u>Concentrates</u>	<u>Wash</u>	<u>Retreat</u>	<u>Total</u>
Holman	799	14,116	14,915
Brown	800	36,311	37,111
North Star		<u>13,157</u>	<u>13,157</u>
	1,599	63,584	65,183

d. Production by Months

<u>Month</u>	<u>Crude Ore</u>						<u>Total</u>
	<u>Holman</u>		<u>Brown</u>		<u>North Star</u>		
	<u>Wash</u>	<u>Retreat</u>	<u>Wash</u>	<u>Retreat</u>	<u>Wash</u>	<u>Retreat</u>	
May			2,773	158,244	2,451	2,167	165,635
June	7,045	82,500		169,741	4,518	5,875	269,679
July	8,849	82,058		82,232	20,547	23,522	217,208
Aug	4,682	24,762	1,685	133,868	27,807	18,196	211,000
Sept	<u>1,295</u>	<u>4,186</u>	<u>1,452</u>	<u>150,642</u>	<u>2,507</u>	<u>37,004</u>	<u>197,086</u>
	21,871	193,506	5,910	694,727	57,830	86,764	1,060,608

<u>Month</u>	<u>Concentrates</u>						<u>Total</u>
	<u>Wash</u>	<u>Retreat</u>	<u>Wash</u>	<u>Retreat</u>	<u>Wash</u>	<u>Retreat</u>	
May			1,797	77,791	2,028	1,212	82,828
June	4,037	43,796		93,069	3,231	3,323	147,456
July	5,227	44,597		41,006	15,210	12,039	118,079
Aug	2,654	13,309	1,034	65,208	20,618	10,752	113,575
Sept	772	2,290	787	71,166	2,131	18,954	96,100
Oct				7			7
	12,690	103,992	3,618	348,247	43,218	46,280	558,045

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### 3. ANALYSIS

#### a. Tonnage and Analysis of Crude Ore Produced

<u>Product</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>
Holman Wash	21,871	42.21	.030	35.49
Holman Retreat	193,506	39.40	.029	39.12
Brown	5,910	41.93	.036	34.77
Brown Retreat	694,727	40.22	.034	38.08
North Star Wash	57,830	49.01	.047	24.79
North Star Retreat	<u>86,764</u>	<u>46.14</u>	<u>.041</u>	<u>28.61</u>
	1,060,608	41.08	.035	36.69

#### b. Tonnage and Analysis of Concentrates Produced

<u>Product</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mn</u>	<u>Alum</u>	<u>Moisture</u>
Holman Bessemer Wash	9,204	58.29	.037	9.74	.18	.34	6.57
Holman Non Bessemer Wash	✓3,486	56.95	.043	12.02	.19	.37	6.58
Holman Bessemer Retreat	62,746	57.42	.037	11.64	.19	.36	6.44
Holman Non Bessemer Retreat	✓41,246	57.81	.039	11.29	.19	.38	6.37
Brown Bessemer Wash	372	55.10	.028	16.30	.19	.36	8.10
Brown Non Bessemer Wash	✓3,246	54.70	.057	14.17	.23	.42	6.67
Brown Bessemer Retreat	182,916	57.27	.036	12.14	.19	.37	6.57
Brown Non Bessemer Retreat	✓165,331	56.99	.058	11.77	.20	.38	6.42
North Star Bessemer Wash	5,912	57.41	.037	11.12	.35	.42	7.65
North Star Non Bessemer Wash	✓37,306	57.05	.061	11.95	.22	.41	8.32
North Star Bessemer Retreat	18,222	57.92	.034	11.18	.35	.40	7.37
North Star Non Bessemer Retreat	✓28,058	<u>57.60</u>	<u>.060</u>	<u>10.90</u>	<u>.31</u>	<u>.39</u>	<u>8.15</u>
	558,045	57.27	.045	11.77	.21	.38	6.73

Non Bess 278,673  
Bess 279,372  

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558,045

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c. Tonnage and Analysis of Concentrates Shipped

Product	Tons	Iron	Phos	Silica	Mn	Alum	Lime	Mag	Sulf	Ign	
										Loss	Moist.
Holman Bessemer Wash	9,204	58.29	.037	9.74	.18	.34	.10	.16	.016	5.96	6.57
Holman Non Bessemer Wash	6,895	55.88	.046	13.88	.19	.38	.10	.16	.016	5.19	6.70
Holman Bessemer Retreat	98,460	57.40	.037	11.67	.19	.36	.10	.16	.016	5.27	6.10
Holman Non Bess Retreat	78,001	56.92	.046	12.08	.21	.39	.10	.16	.016	5.46	6.13
Brown Bessemer Wash	372	55.10	.028	16.30	.19	.36	.10	.16	.016	3.95	8.10
Brown Non Bessemer Wash	2,835	54.68	.055	14.07	.22	.42	.10	.16	.016	6.61	6.51
Brown Bessemer Retreat	220,832	57.30	.034	12.27	.20	.38	.10	.16	.016	4.78	6.29
Brown Non Bess Retreat	186,405	56.92	.058	11.92	.19	.38	.10	.16	.016	5.63	6.26
North Star Bessemer Retreat	18,222	57.92	.034	11.18	.35	.40	.10	.16	.016	4.75	7.37
North Star Bessemer Wash	5,912	57.41	.037	11.12	.35	.42	.10	.16	.016	5.51	7.65
North Star Non Bess Retreat	14,901	57.92	.062	10.81	.25	.38	.10	.16	.016	5.22	8.39
North Star Non Bess Wash	<u>37,306</u>	<u>57.05</u>	<u>.061</u>	<u>11.95</u>	<u>.22</u>	<u>.41</u>	<u>.10</u>	<u>.16</u>	<u>.016</u>	<u>5.34</u>	<u>8.32</u>
	679,345	57.17	.045	11.97	.21	.38	.10	.16	.016	5.23	6.45

d. Mine Analysis of Ore in Stockpile

Concentrates	Tons	Iron	Phos	Silica	Mn	Alum	Moisture
Holman Wash	799	58.78	.044	8.93	.19	.35	6.30
Holman Retreat	14,116	58.16	.035	11.18	.18	.37	6.72
Brown Wash	800	56.13	.052	13.22	.21	.38	6.71
Brown Retreat	36,311	57.08	.055	11.99	.18	.37	6.86
North Star Retreat	<u>13,157</u>	<u>57.23</u>	<u>.057</u>	<u>11.00</u>	<u>.38</u>	<u>.40</u>	<u>7.87</u>
	65,183	57.35	.051	11.59	.22	.38	7.02

4. ESTIMATE of ORE RESERVES

a. Developed Ore - Factors Used

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

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b. Ore Reserves as of December 31, 1954

<u>Lease</u>	<u>Reserve 12-31-53</u>	<u>Mined 1954</u>	<u>Balance after Mining</u>	<u>Changed by Re-estimate</u>	<u>Reserve 12-31-54</u>
North Star					
N $\frac{1}{2}$ -NE 21-56-24	618,763	89,498	529,265	<del>162,840</del>	692,105
Bingham					
NW-SE 21-56-24	1,533,233		1,533,233		1,533,233
Holman					
SE-NE 21-56-24	1,439,629	116,682	1,322,947		1,322,947
Brown No. 1					
SW-NE 21-56-24	514,902	96,218	418,684		418,684
Brown No. 2					
SW-NW 22-56-24	<u>2,571,040</u>	<u>255,647</u>	<u>2,315,393</u>		<u>2,315,393</u>
	6,677,567	558,045	6,119,522	<del>162,840</del>	6,282,362

c. Estimate of Analyses of Reserves

<u>Product</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>
<u>North Star</u>						
Bessemer Wash Concentrates	164,497	58.42	.023	10.50	.16	.40
Non Bessemer Wash Concentrates	155,563	53.70	.050	11.12	.28	.40
Bessemer Retreat Concentrates	216,886	55.55	.026	11.31		
Non Bess Retreat Concentrates	<u>155,159</u>	<u>55.66</u>	<u>.048</u>	<u>11.00</u>		
	692,105	55.84	.036	11.01	.22	.40
<u>Bingham</u>						
Non Bessemer Merch	53,259	57.98	.051	11.83		
Bess Wash Concentrate	516,528	58.39	.031	11.34	.16	.49
Non Bess Wash Concentrate	281,237	57.98	.049	11.06	.51	.44
Bessemer Retreat Concentrate	272,782	57.21	.034	12.03		
Non Bess Retreat Concentrate	<u>409,427</u>	<u>57.83</u>	<u>.047</u>	<u>12.20</u>		
	1,533,233	57.94	.040	11.66	.28	.47

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<u>Product</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>
<u>Holman</u>						
Bess Wash Concentrates	750,960	57.87	.029	10.91	.16	.43
Non Bess Wash Concts.	282,232	56.63	.056	12.06	.17	.48
Bess Retreat Concentrates	257,281	56.70	.026	12.15		
Non Bess Retreat Concts.	<u>32,474</u>	<u>56.36</u>	<u>.058</u>	<u>11.72</u>		
	1,322,947	57.32	.035	11.42	.16	.44
<u>Brown No. 1</u>						
Bess Wash Concentrates	153,549	58.32	.033	11.21	.28	.36
Non Bess Wash Concts.	47,619	58.97	.046	10.40	.14	.53
Bess Retreat Concentrates	<u>217,516</u>	<u>56.36</u>	<u>.031</u>	<u>12.70</u>		
	418,684	57.38	.033	11.89	.25	.40
<u>Brown No. 2</u>						
Bess Wash Concentrates	880,958	57.70	.027	11.43	.17	.45
Non Bess Wash Concts.	401,862	56.56	.061	11.40	.16	.41
Bess Retreat Concentrates	564,239	56.68	.024	12.52		
Non Bess Retreat Concts.	<u>468,334</u>	<u>56.43</u>	<u>.063</u>	<u>12.20</u>		
	2,315,393	57.00	.039	11.85	.17	.44
<u>North Star &amp; Bingham</u>						
Non Bessemer Direct	53,259	57.98	.051	11.83		
Bess Wash Concentrates	681,025	58.39	.029	11.14	.16	.47
Non Bess Wash Concts.	436,800	56.46	.049	11.08	.43	.43
Bess Retreat Concentrates	489,668	56.47	.030	11.71		
Non Bess Retreat Concts.	<u>564,586</u>	<u>57.23</u>	<u>.047</u>	<u>11.87</u>		
	2,225,338	57.28	.038	11.46	.31	.45
<u>Holman &amp; Brown</u>						
Bess Wash Concentrates	1,785,467	57.82	.028	11.19	.18	.44
Non Bess Wash Concts.	731,713	56.74	.058	11.59	.16	.45
Bess Retreat Concentrates	1,039,036	56.62	.026	12.47		
Non Bess Retreat Concts.	<u>500,808</u>	<u>56.43</u>	<u>.063</u>	<u>12.19</u>		
	4,057,024	57.15	.037	11.71	.18	.44
<u>Total Direct</u>						
	53,259	57.98	.051	11.83		
<u>Total Wash Concentrates</u>						
Bessemer	2,466,492	57.98	.028	11.18	.18	.45
Non Bessemer	<u>1,168,513</u>	<u>56.64</u>	<u>.055</u>	<u>11.40</u>	<u>.26</u>	<u>.44</u>
	3,635,005	57.55	.037	11.25	.21	.45

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<u>Product</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>
<u>Total Retreat Concts.</u>						
Bessemer	1,528,704	56.57	.029	12.23		
Non Bessemer	<u>1,065,394</u>	<u>56.85</u>	<u>.055</u>	<u>12.02</u>		
	2,594,098	56.68	.040	12.14		
<u>Total Mine</u>						
Bessemer	3,995,196	57.44	.028	11.58	.18	.45
Non Bessemer	<u>2,287,166</u>	<u>56.77</u>	<u>.055</u>	<u>11.70</u>	<u>.26</u>	<u>.44</u>
	6,282,362	57.20	.038	11.62	.21	.45

#### 5. LABOR and WAGES

##### a. Comments

The supply of labor was ample and of average quality. An increase of \$0.05 per hour went into effect as of July 1.

##### b. Comparative Statement of Production and Wages

<u>Product</u>	<u>1953</u>			<u>1954</u>
	<u>Lake Concentrator</u>	<u>Pit Only</u>	<u>Total</u>	<u>Pit Only</u>
Wash and Retreat Concts.	121,246	850,053	971,229	558,045
Number of Days Mine Operated	98	104	104	92
Average Number of Men Working	39	172	211	150
Average Wages Per Day	\$16.81	\$18.35	\$18.07	\$19.22
Production Per Man Per Day	30.27	47.39	44.32	40.53
Labor Cost Per Ton	\$0.555	\$0.387	\$0.408	\$0.474
Total Number of Man Days	4,006	17,938	21,944	13,768
Amount Paid for Labor	\$67,338.29	\$329,338.29	\$396,566.90	\$264,588.48

#### 6. GENERAL SURFACE

##### a. Buildings and Repair

Only minimum maintenance work was carried on throughout the year on mine and company owned residence buildings.



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b. Roads, Transmission Lines, Etc.

Minor changes were made in pit transmission lines due to ore and stripping operations.

c. Miscellaneous General Construction

A new baffle dyke was constructed in the tailings basin to allow for further settling of tailings before returning water to Hill Lake.

7. OPEN PIT

a. Stripping

Stripping operations were carried forward during the year under the following E&A's:

E&A No. MC-234: Operations were conducted on the third shift during ore operations and in conjunction with pit cleanup. Work started on May 6 and ended on September 30, and entailed movement of surface from the North Star NE-NE, and taconite and lean ore from the Brown #2.

E&A No. MC-271: Work was started on October 4 on a 16-shift-per-week schedule and was suspended on November 20. Surface was moved from the North Star NW-NE, and taconite and lean ore from the Brown #2.

The following tabulation shows the material removed from the various leases during the year:

<u>Lease</u>	<u>Surface</u>	<u>Taconite</u>	<u>Lean Ore</u>	<u>Total</u>
<u>E&amp;A MC-234</u>				
Brown #2		52,000	60,349	112,349
North Star	21,560			21,560
Holman		1,880		1,880
	<u>21,560</u>	<u>53,880</u>	<u>60,349</u>	<u>135,789</u>

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<u>Lease</u>	<u>Surface</u>	<u>Taconite</u>	<u>Lean Ore</u>	<u>Total</u>
<u>E&amp;A MC-271</u>				
Brown #2		97,573	44,663	142,236
North Star	268,205			268,205
Holman				
	<u>268,205</u>	<u>97,573</u>	<u>44,663</u>	<u>410,441</u>
<u>Final Total</u>	289,765	151,453	105,012	546,230

The cost of stripping under E&A MC-271 was \$0.312 per yard as compared to a budget estimate of \$0.389. An average of 3,681 cubic yards was produced per shift.

b. Open Pit Mining

On May 6, mining of crude ore from the pit was started on a 5-day, 2 shift schedule with two shovels serviced by six to seven trucks. On July 12, because of tonnage cutbacks, operations were reduced to a 4-day-per-week schedule and continued thus until the end of ore season on September 30. During the season, the third shift was engaged in pit cleanup and stripping.

A total of 1,233,493 tons of gross crude was moved during the season on 184 shifts at an average rate of 6,704 tons per shift; from this crude, 172,885 tons of screen rock were removed, giving a total net crude of 1,060,608 tons and a shift average of 5,764 tons.

A total of 237,409 tons of pit rock, lean, and waste material was moved and placed on respective dumps at a ratio of .425 tons and a cost of \$0.020 per ton of shipping ore.

The following table shows material mined from various leases:

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<u>Lease</u>	<u>Gross Crude</u>	<u>Screen Rock</u>	<u>Net Crude</u>	<u>Pit Rock Lean and Waste Material</u>
Holman	242,057	26,680	215,377	57,141
Brown	806,580	105,615	700,965	155,948
North Star	<u>185,184</u>	<u>40,590</u>	<u>144,594</u>	<u>24,320</u>
	1,233,821	172,885	1,060,936	237,409

Holman Lease: Mining on the Holman lease was mainly from the pit bottom along the south side. Approximately 90 per cent of the ore mined was retreat and 10 per cent was wash ore.

Brown Lease: Operations on Brown leases were about 30 per cent on Brown No. 1 and 70 per cent on Brown No. 2. From the Brown No. 1, ore was mined from a trough in the northeast corner of the forty along the old lean ore dump. On Brown No. 2, the bulk of the loading was from the various benches on the east side together with some mining of high grade material in the pit bottom from the central part of the forty. Of the ore mined from Brown leases, approximately 99 per cent was retreat and only one per cent was wash crude.

North Star Lease: Practically all mining on the North Star lease was from NE-NE along the north shoreline. This material was 40 per cent wash and 60 per cent retreat crude.

Of the total ore mined from all leases during the year, approximately 8 per cent was wash and 92 per cent was retreat crude.

During the latter part of the season, a new sump was excavated on Brown No. 2 just north of the old sump in the pit bottom.

Two shovels operating in the mine mixing ores from each helped meet grading requirements. Conditions were average throughout the season and no serious delays were encountered. Cost of producing crude ore was \$0.281 per ton as compared to \$0.195 in 1953.

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c. Pumping and Drainage

During the latter part of the ore season, a new sump was excavated for gathering pit water. A new 3000-gallon-per-minute, 450-foot head, automatically controlled pump was installed replacing the 2-stage pumping arrangement of three pumps in series and eliminating pumpmen. A new discharge line constructed in the southeast corner of the pit is working satisfactorily and with the greater pumping capacity, it will take less time to dewater the pit bottom after severe rain storms. Pumping cost per ton of shipping ore was \$0.049 as compared to \$0.016 in 1953. The installation cost of this new pump setup was absorbed in this item.

d. General Pit Activities

Minor power line and road changes due to ore operations resulted in a cost of \$0.014 per ton of shipping ore, the same as in 1953.

8. BENEFICIATION

a. Pit Plant

The pit plant, operating on the same schedule as the pit, treated both wash and retreat ores as required. Work started on May 6 on a 2-shift, 5-day-per-week schedule and was reduced to a 2-shift, 4-day-per-week schedule on July 12. A third shift worked on repairs.

A total of 1,060,608 tons of crude ore was treated to obtain 558,045 tons of concentrates for a net weight recovery of 52.6 per cent and an average rate of production of 3,033 tons of concentrates per shift.

Of the wash ore portion of the feed, 85,611 tons of crude produced 59,526 tons of concentrates at a weight recovery of 69.5 per cent. The retreat feed of 975,325 tons of crude produced 498,519 tons of concentrates at a weight recovery of 51.1 per cent. The gross weight recovery was 45.2 per cent as compared to 45.3 per cent in 1953.

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

Tests were conducted throughout the entire season on ores through the Hardinge concentrator circuit in the pilot plant and through the Remer jig installation. Holman-Cliffs ores processed through

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the Hardinge circuit gave generally poor results. The Remer jig installation was put into operation the latter part of May and operated the balance of the season. The bulk of the tests were on Holman-Cliffs ores, but several tests were also made on Hill-Trumbull and Canisteo ores. These results, together with the Hardinge tests, will be the subject of a separate report by the District Ore Test Laboratory.

A shortage of railroad cars necessitated stockpiling for 400 hours, and a total of 147,892 tons were stocked which, with a balance of 186,483 tons from 1953, made a total of 334,375 tons. Concentrates were loaded out intermittently from April 19 to November 20 and a total of 269,192 tons was shipped, leaving a balance of 65,183 tons as of December 31. In order to reduce the amount of taxable ore remaining in stock from 1953, all production was stockpiled from September 19 to the end of the season and all shipments were made from stockpile.

Plant delays were at an all time low during the season and a very satisfactory operation was maintained. The following tabulation shows time lost on production due to delays:

Washing Plant

<u>Source of Delay</u>	<u>Hours</u>	<u>Per Cent of Total Working Hours</u>
Out of Ore	2.92	0.20
Crude Ore Pocket	2.00	0.14
8-Foot Pan Conveyor	0.25	0.02
Pit Screening Plant	2.25	0.15
Crude Ore Conveyors	0.33	0.02
Fine Heavy Media Feed Conveyor	0.58	0.04
Akins Classifiers	0.50	0.03
Stockpile Conveyor	1.33	0.09
Electric Power	2.34	0.16
Air Compressor	<u>0.33</u>	<u>0.02</u>
	12.83	0.87

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<u>Source of Delay</u>	<u>Hours</u>	<u>Per Cent of Total Working Hours</u>
<u>Recapitulation</u>		
Crude Ore Delays to Head of Plant	7.42	0.50
Ore Processing Delays	<u>5.41</u>	<u>0.37</u>
	12.83	0.87

<u>Heavy-Media Plant</u>		
Miscellaneous Plant Delays (Washing)	10.33	0.77
Fine Heavy-Media Feed Conveyor	0.58	0.04
Coarse Reject Wash Screen	<u>2.50</u>	<u>0.19</u>
	13.41	1.00

<u>Recapitulation</u>		
Crude Ore Delays to Head of Plant	10.33	0.77
Ore Processing Delays	<u>3.08</u>	<u>0.23</u>
	13.41	1.00

b. Lake Concentrator No operations.

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

<u>Washing Plant Product</u>	<u>Tonnage</u>	<u>Per Cent</u>		<u>Recovery</u>	
		<u>Total Mined</u>	<u>Iron Dried</u>	<u>Tonnage</u>	<u>Iron Unit</u>
Crude Ore & Rock Mined	105,551	100.00	43.09		
Less: Rock Removed in Mining	4,425	4.19	28.77		
Crude Ore Transfer to Screen Plant	101,126	95.81	43.72		
Less: Rock Reject in Screen Plant	15,515	14.70	26.80		
Crude Ore Entering Mill	85,611	81.11	46.78		
Concentrates Produced	59,526	56.40	57.13	69.53	84.91
Tailings (by Deduction)	26,085	24.71	23.16		

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<u>Retreat Plant Product</u>	<u>Tonnage</u>	<u>Per Cent</u>		<u>Recovery</u>	
		<u>Total Mined</u>	<u>Iron Dried</u>	<u>Tonnage</u>	<u>Iron Unit</u>
Crude Ore & Rock Mined	1,191,302	100.00	37.91		
Less: Rock Removed in Mining	58,935	4.95	26.48		
Crude Ore Transfer to Screen Plant	1,132,367	95.05	38.50		
Less: Rock Rejects in Screen Plant	157,370	13.21	25.63		
Crude Ore Entering Mill	974,997	81.84	40.58		
Concentrates Produced	498,519	41.85	57.28	51.13	72.17
Heavy Density Rejects Scalped	126,794	10.64	40.49		
Tailings (by Deduction)	349,684	29.35	16.80		

#### 9. MAINTENANCE and REPAIRS

The usual maintenance work on all mine and plant equipment was carried on throughout the year until close of operations on November 20.

The Winter & Idle repair program on both mine and plant equipment was continued from the first of the year until the start of ore operations on May 6. Owing to the short production season, no repairs were made in the fall of the year and the mine was on a standby basis from November 20 until the end of the year.

#### 10. COST of OPERATIONS

##### a. Comparative Cost of Operation

<u>Product</u>	<u>1953</u>	<u>1954</u>	<u>Budget 1954</u>
Tons of Crude Ore	1,876,403	1,233,493	1,316,777
Tons of Concentrates	850,053	558,045	596,500
Recovery-Per Cent	45.3	45.2	45.3
Average Shift Output	2,993	3,033	3,000
Tons Per Man Per Day	47.39	40.53	40.00
Shifts Operated	284	184	199

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<u>Costs</u>	<u>1953</u>	<u>1954</u>	<u>Budget 1954</u>
Pit Operating	\$0.195	\$0.285	\$0.296
Concentrating	0.145	0.165	0.160
Loading Stockpile	0.008	0.020	0.011
General Mine Expense	0.184	0.307	0.225
Winter & Idle	<u>0.426</u>	<u>0.776</u>	<u>0.742</u>
Cost of Production	<u>\$1.415</u>	<u>\$2.099</u>	<u>\$1.985</u>

b. Comments

Cost of production for 1954 was \$0.684 per ton higher than for 1953 and \$0.114 per ton higher than the budget.

In comparison with 1953, we find the following:

Pit Operating: Rental of leased trucks and pumping and drainage were the largest increases here. The truck rental fleet was increased to six and was used almost exclusively during the year. A new sump was excavated and a new discharge line installed in 1954 which increased pumping and drainage costs. Other increases were minor and were due mainly to reduced tonnage in 1954.

Concentrating: An increase resulted from a full season of ore testing in the pilot plant and in the Remer jig unit.

General Mine Expense: This item was considerably higher due to the fact that all items under this caption were predominately overhead and were not cut back in proportion to the lower tonnage produced in 1954.

Winter & Idle: The largest increase occurred here due, in part to the heavy repair program carried forward from the first of the year and charged against a greatly reduced tonnage in 1954. The Lake concentrator plant was put into condition for operating but then was not operated during 1954. Overhead charges from outside the mines not cut back in proportion to decreased tonnage greatly increased Winter & Idle expenses.



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Comparing 1954 costs with the budget costs, under Pit Operating increases were minor and were offset by decreases in various other items. The same is true of the Concentrating account. Most of the increase in 1954 costs over the budget was in General Mine Expense and Winter & Idle. Again, overhead charges outside the mine account for much of the increase. Although some savings were effected in this item, it was not as large as estimated when the budget was made.

#### 11. EXPLORATION and FUTURE EXPLORATION

The Henry Schultze Company drilled on the North Star lease from the first of the year until the end of May with one drill rig; and although no additional ore was proven up, the ore body was definitely outlined and information on the grade of ore was obtained.

It will be necessary in the near future to start a drilling program on the east side of the Bingham and Brown No. 1 forties to definitely outline the ore body in this area.

#### 12. TAXES

	1954		1953		Increase Decrease	
	Assessed Value	Taxes	Assessed Value	Taxes	Assessed Value	Taxes
Mineral	\$ 996,820	\$154,427.35	\$1,079,355	\$166,328.61	-\$82,535	-\$11,901.26
Lands,Bldgs,Mach.	122,672	19,427.76	110,648	17,326.28	12,024	2,101.48
<u>Personal Property</u>						
Equipment	76,557	11,860.21	77,936	12,084.51	- 1,379	- 224.30
Stockpile	40,414	6,260.94	101	15.56	40,313	6,245.38
Lake Conct.S.P.	62,488	10,695.49	22,859	3,761.40	39,629	6,934.09
	<u>\$1,298,951</u>	<u>\$202,671.75</u>	<u>\$1,290,899</u>	<u>\$199,516.36</u>	<u>\$ 8,052</u>	<u>\$ 3,155.39</u>
Avg. Mill Rate		156.03		154.56	+	.95%

Mineral value decreased by production. All buildings in Village of Taconite--tax value increased by 25 per cent; all buildings in Town of Iron Range--tax value increased by 10 per cent; by order of Commissioner of Taxation, State of Minnesota.

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Concentrate stockpile of 145,217 tons on hand as of May 1, 1954, compared to 360 tons on hand May 1, 1953. Lake concentrator stockpile per ton value increased from \$0.046 in 1953 to \$0.156 in 1954.

Tax Commission Reserve

	Tons <u>1954</u>	Tons <u>1953</u>	Increase <u>Decrease</u>
May 1	6,677,567	7,487,378	-809,811
Lake Concentrator	400,566	496,948	- 96,382

Reserve decreased by production.

13. ACCIDENTS and PERSONAL INJURY

There were no compensable accidents at this property in 1954.

14. NEW CONSTRUCTION

a. Completed during 1954

A new sump was excavated in the pit and a new pump and discharge line installed.

b. To Be Completed during 1955: None

15. EQUIPMENT RECEIVED and PROPOSED NEW EQUIPMENT

a. Received during 1954

10x8 AC Pump and 450 HP Motor  
Automatic Controls for Stacker  
Pickup Truck for District Ore Test Laboratory  
3/4-Ton Pettibone Mulliken Swing Loader  
4x11 Foot Feeder for Pit Screening Plant  
Three 34-Ton Euclid Rental Trucks

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b. Proposed Equipment for 1955

Equipment for Conversion of Heating Plants in Mine Buildings  
to Automatic Oil.

450 HP Motor and Spare Pump Parts for Pit Dewatering.

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1. GENERAL

The only activity at the Sally mine consisted of completing a test pit begun in December of 1953. This test pit was sunk to 43 feet by January 1, 1954, and was completed at 70 feet during January. The pit was sunk to check nearby drill holes and was to be the basis for establishing a drilling program. Due to curtailment of activities, this drilling program was abandoned.

No change has been made in the reserve estimate.

TAXES

	<u>1954</u>		<u>1953</u>		<u>Increase</u>
	<u>Assessed</u> <u>Value</u>	<u>Taxes</u>	<u>Assessed</u> <u>Value</u>	<u>Taxes</u>	<u>Decrease</u>
Mineral	\$231,247	\$35,438.60	\$231,247	\$35,284.27	\$154.33
Land	666	109.43	666	78.11	31.32
	<u>\$231,913</u>	<u>\$35,548.03</u>	<u>\$231,913</u>	<u>\$35,362.38</u>	<u>\$185.65</u>
Avg. Mill Rate		153.28		152.48	+ .52%

No changes except in Mill Rate.

TAX COMMISSION RESERVE

May 1

Tons

<u>1954</u>	<u>1953</u>
1,751,579	1,751,579

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Stripping under E&A No. CC-598 continued through January 16 in the old milling pit, when entry was made into the underground drift for pit drainage. The shovel was then moved to the shops for repairs.

A small crew repaired trucks, tractors, and the shovel during February, March, and April; and on May 10, the shovel was moved for approach road cleanup and stabilizing. On May 20, crude wash ore was mined from the south side of the pit and placed in stockpile at the washing plant. All ore mined, whether wash or direct, was first screened at the crushing and screening plant. A very small amount of oversize was crushed to keep down the silica.

Washing of ore started on May 25 with a 3-man crew on a 1-shift, 40-hour-per-week schedule until July 6, when the work week was reduced to 32 hours. Sufficient water was obtained from the drainage ditch on the east side of the Great Northern tracks and by recirculation of water from the tailings pond.

Work continued with the 3-1/4 yard shovel during June, July, and August, using five to seven 22-ton trucks. On September 17, all operations ceased and equipment was taken out of the pit; all crews were transferred to other properties, leaving no employees on the payroll during October and November, and two employees in December.

For the season, 33,773 cubic yards of rock, surface, paint rock, and cave material were removed and charged to ore operations.

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## 2. PRODUCTION-SHIPMENTS-INVENTORIES

### a. Production by Grades

<u>Product</u>	<u>Tons</u>
Crude Ore	36,748
Concentrates	33,658
Direct Ore	41,340

### b. Shipments

Direct Ore	41,340
Concentrates	33,568
	<u>74,998</u>

### c. Stockpile Inventories None

### d. Production by Months

<u>Month</u>	<u>Crude</u>	<u>Concentrates</u>	
	<u>Open Pit</u>	<u>Open Pit</u>	<u>Direct</u>
May	1,953	1,474	
June	11,094	9,975	18,414
July	9,303	8,601	13,374
Aug	10,002	8,949	7,825
Sept	<u>4,396</u>	<u>4,659</u>	<u>1,727</u>
	36,748	33,658	41,340

## 3. ANALYSIS

### a. Tonnage and Analysis of Crude Ore

<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>
36,748	53.51	.051	16.80

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b. Tonnage & Complete Analyses Produced and Shipped

<u>Product</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>	<u>Lime</u>	<u>Mag</u>	<u>Sulf</u>	<u>Ign Loss</u>	<u>Moist</u>
Concts.	33,658	57.89	.053	10.64	.76	1.26	.32	.20	.010	3.59	11.82
Direct	<u>41,340</u>	<u>57.02</u>	<u>.049</u>	<u>10.76</u>	<u>.83</u>	<u>1.82</u>	<u>.31</u>	<u>.21</u>	<u>.011</u>	<u>4.06</u>	<u>13.95</u>
	74,998	57.41	.051	10.71	.80	1.57	.31	.21	.011	3.84	12.99

4. ESTIMATE of ORE RESERVES

a. Developed Ore-Factors Used

<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, 1954

<u>Lease</u>	<u>Reserve 12-31-53</u>	<u>Mined 1954</u>	<u>Balance after Mining</u>	<u>Changed by Re-Estimate</u>	<u>Reserve 12-31-54</u>
SW-SE, 23-57-22	71,188	67,398	3,790	56,210	60,000
NW-NE, 23-57-22		<u>7,600</u>			
	<u>71,188</u>	<u>74,994</u>	<u>3,790</u>	<u>56,210</u>	<u>60,000</u>

c. Estimated Analysis of Reserves

<u>Open Pit</u>	<u>Non Bessemer</u>									
<u>SW-SE, 23-57-22</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>	<u>Moist</u>	<u>Iron Natural</u>		
Merch	5,000	56.50	.055	11.48	1.33	2.99	14.00	48.44		
Wash Concts.	<u>55,000</u>	<u>56.00</u>	<u>.040</u>	<u>12.14</u>	<u>1.39</u>	<u>1.66</u>	<u>12.00</u>	<u>49.28</u>		
	60,000	56.04	.041	12.08	1.38	1.77	12.16	49.22		

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All of the merch ore will be of a Non Bessemer grade, but a considerable portion of the bottom ore will be of a Bessemer grade. Some ore might be available by trespass on Mesabi-Chief line.

d. Prospective Reserves

<u>Material</u>	<u>Tons</u>	<u>Iron</u>	<u>Moisture</u>	<u>Natural Iron</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 and WAGES

a. Comments

Labor supply was plentiful and labor relations were good.

b. Comparative Statement of Wages and Product

Tons	74,998
Number of Days Operated	71
Number of Shifts Operated	71
Average Daily Product	1056.3
Average Product Per Shift	1056.3
Average Production Per Man Per Day	42.09
Average Wages Per Hour-Ore Season	\$2.480
Amount Paid for Labor-Ore Season	\$35,580.89
Labor Cost Per Ton	\$0.474

6. GENERAL SURFACE

a. Building and Repair

No work was done in 1954 and none is contemplated.



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b. Roads, Transmission Lines, Etc.

No new work is proposed at the present time.

The work of stabilizing the lower portion of the approach road was completed in the spring of 1954.

c. Miscellaneous General Construction

A small dam was completed before the ore season started. This dam regulated the flow of water in the ditch on the east side of the Great Northern tracks so that all the water required for concentrating was obtained from this source and it also maintained a level of water in the sump that would not overflow and endanger the Great Northern tracks. No new work is contemplated for 1955.

7. OPEN PIT

a. Stripping

Stripping under E&A No. CC-598 was carried on through January 15, 1954, on a 3-shift, 5-day-per-week schedule when an approach grade was connected with the underground drift for pit drainage. All pit work was stopped and on May 10, stripping was resumed in the old milling pit on a 1-shift, 5-day-per-week schedule, mostly in old drifts cleaning up cave material and rock.

Following is a summary of 1954 stripping and costs:

<u>E&amp;A No.</u>	<u>Cubic Yards Stripped 1954</u>	<u>Estimated Cost</u>	<u>Actual Cost</u>	<u>Over or Under</u>
598	38,973	\$0.491	\$0.563	<del>/\$0.072</del>
635	<u>18,920</u>	<u>0.501</u>	<u>0.599</u>	<del>/\$0.098</del>
	57,893	\$0.494	\$0.575	<del>/\$0.081</del>

Costs were higher because yardage involved digging down to the old drift for pit drainage and digging out and stabilizing the lower portion of the approach road in the cave; some yardage also involved cleaning up taconite before and after ore shipments had begun.

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b. Open Pit Mining

For the season, a total of 74,998 tons was shipped including 41,340 tons of direct ore and 33,658 tons of concentrates. Ore shipments were discontinued on September 17. To obtain this ore, 33,773 cubic yards, or 51,712 tons of waste, rock, etc. were removed and charged to operating. Average production per shift for 1954 was 1056.3 as compared to 1098 in 1953. Including the 51,712 tons of waste, rock, etc. removed, the average for 1954 was 1967 tons per shift. All material removed was on an approach road of 11.3 per cent grade.

Ore shipped in 1954 came from a pillar left by the underground operations and from old caves and borderline area along the rock walls.

For each 1-1/2 tons of ore shipped, 1 ton of lean ore, waste, and rock was removed in 1954 as compared to 5 tons of ore shipped to 1 ton of lean ore, waste, and rock removed in 1953.

c. Drainage and Pumping

No pumping was necessary as water drained into the old drifts and towards the shaft. Some pumping will be required in 1955 to mine what ore is below drift elevation, but the discharge will be into these drifts.

8. BENEFICIATION

a. Plant Operation

The screening plant operated satisfactorily with a minimum of delays and the crusher was not used to keep down the silica content of the ore. Due to the nature of the ore and the large amount of wood and timber from old drifts, it was best only to screen it.

Recovery from the washing plant was 91.5 per cent in 1954. All crude ore was first screened and placed in stockpile at the washing plant where it was drawn by scraper to the pan feeder and crude belt. The plant operated 568 hours and lost 30, or about 5.3 per cent, waiting for empties and other miscellaneous delays.

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9. MAINTENANCE and REPAIRS None

10. COST of OPERATIONS

a. Comparative Cost Statement

<u>Product</u>	1954 Budget Revised 7-14-54	Cost Per Ton 1954	Cost Per Ton 1953
Direct Ore	44,261	41,340	53,568
Concentrates	52,739	33,568	3,394
Average Daily Output		1056.3	1097.8
Tons Per Man Per Day		42.90	41.64
Days Operated		71	54.75
<u>Costs</u>			
Total Pit Operating	\$0.535	\$0.583	\$0.641
Total Concentrating	0.135	0.123	0.359
Total General Mine Expense	0.303	0.381	0.335
Total Winter & Idle	0.311	0.579	0.406
	<u>\$1.375</u>	<u>\$1.695</u>	<u>\$1.455</u>
<u>Depreciation</u>			
Plant & Equipment		0.296	0.591
Motorized Equipment & Other		0.089	0.037
Movable Equipment		0.009	0.005
<u>Taxes</u>			
Ad Valorem		0.310	0.147
Occupational		0.057	-0.085
Royalty		<u>0.081</u>	<u>0.082</u>
Total Depreciation & Taxes		\$0.842	\$0.777
Administrative Expense & Income		0.131	0.050
Miscellaneous Expense & Income		<u>0.020</u>	<u>0.093</u>
Total Cost at Mine		\$2.688	\$2.375

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11. EXPLORATION and FUTURE EXPLORATION None

12. TAXES

a. Underground and Open Pit

	<u>1954</u>		<u>1953</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	\$ 77,157	\$21,217.79	\$64,195	\$16,869.53	\$12,962	\$4,348.26
Lands,Bldgs,Mach.	19,444	5,258.10	19,301	4,929.60	143	328.50
<u>Personal Property</u>						
Equipment	5,852	1,633.99	4,241	1,122.85	1,611	511.14
Stockpile			872	230.87	- 872	- 230.87
	<u>\$102,453</u>	<u>\$28,109.88</u>	<u>\$88,609</u>	<u>\$23,152.85</u>	<u>\$13,844</u>	<u>\$4,957.03</u>
Avg. Mill Rate		274.13		261.29		4 10.49%

1953 figures shown are final after compromise agreement as to reserve values.

Ore reserve increased 2,852,590 tons after re-estimate by State; however, 3,672,200 tons of taxable reserve is classed as underground merch concentrate and retreat at a low value of \$.02, \$.01, and \$.005 per ton respectively.

Values on buildings in Town of Nashwauk were increased by 10 per cent.

Tax Commission Reserve

May 1

<u>Tons</u>	<u>Tons</u>	<u>Increase</u>
<u>1954</u>	<u>1953</u>	<u>Decrease</u>
3,798,700	946,110	2,852,590

Re-estimate by State as of May 1, 1954.

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13. ACCIDENTS and PERSONAL INJURY

Francis Belanger: On April 26, 1954, while changing a truck spring, felt soreness in lower abdomen where hernia operation had previously been performed. Compensation paid: Approximately \$280.

14. PROPOSED NEW CONSTRUCTION None

15. EQUIPMENT RECEIVED and PROPOSED NEW EQUIPMENT None

WANLESS MINE  
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1. GENERAL

At the close of 1953, the Wanless mine was shut down with crews reduced to pumpmen, foremen, and clerks. Pit pumping was the only activity.

In February, it was determined that the Wanless would not be operated in 1954. All movable equipment was removed, warehouse supplies were transferred to the central warehouse, and foremen and clerks were transferred to other properties. The office and shops were locked, windows and doors shuttered, and by April 9 the mine was completely shut down. Pit pumping by Cliffs ceased, but the Snyder Mining Company continued pumping in the Wanless mine in order to hold down the water in their adjoining Whiteside property.

No changes have been made in the reserve estimate.

TAXES

	<u>1954</u>		<u>1953</u>		<u>Increase Decrease</u>	
	<u>Assessed Value</u>	<u>Taxes</u>	<u>Assessed Value</u>	<u>Taxes</u>	<u>Assessed Value</u>	<u>Taxes</u>
Mineral	\$157,014	\$12,763.67	\$186,790	\$16,796.16	-\$29,776	-\$4,032.49
Land, Bldg, Mach.	1,982	163.69	1,870	168.15	112	4.46
<u>Personal Prpty</u>						
Equipment	1,115	90.64	14,294	1,285.32	- 13,179	- 1,194.68
Stockpile	2,357	191.60	2,357	211.94	-	20.34
	<u>\$162,468</u>	<u>\$13,209.60</u>	<u>\$205,311</u>	<u>\$18,461.57</u>	<u>-\$42,843</u>	<u>-\$5,251.97</u>
Avg. Mill Rate		81.31		89.92	-	10.59%

Mineral revalued by State on present worth basis. Most equipment removed from property. Lean ore stockpile remains the same.

Tax Commission Reserve

Tons-May 1, 1954	1,419,971
Tons-May 1, 1953	<u>1,551,523</u>
Decrease	- 131,552

## Safety Department

## Annual Report

Year 1954

11. ACCIDENTS  
AND  
PERSONAL  
INJURYa. Fatal Accidents

It is with the greatest pleasure and gratitude that I report no fatal accidents during 1954. This is the third year since 1898, when accident records were first made up by the company, that there have been no fatal injuries. The other years were 1932, when only 630 men were employed, and 1946, when 2,791 men were employed. The average number of men employed in 1954 was 3,946.

Table Number One, covering period 1898 to 1954, inclusive, covers fatality rate based on "Per Thousand Employees".

Table Number Two covers causes of fatal accidents, 1898 to 1954, inclusive, and Table Number Three, the classifications by the Central Safety Committee, covering period 1911 to 1954, inclusive.

## Safety Department

## Annual Report

Year 1954

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

TABLE I

FATAL ACCIDENT RECORD  
THE CLEVELAND-CLIFFS IRON CO. AND CLIFFS POWER & LIGHT CO.  
1898-1954, 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
	<u>3,666</u>	<u>14</u>	<u>3.79</u>
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
	<u>7,729</u>	<u>41</u>	<u>5.30</u>
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
	<u>13,028</u>	<u>66</u>	<u>5.06</u>
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
	<u>13,332</u>	<u>35</u>	<u>2.70</u>
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
	<u>18,348</u>	<u>43</u>	<u>2.36</u>
1921	2309	6	2.60
1922	2301	1	.43
1923	2728	6	2.20
1924	2472	5	2.02
1925	2472	2	.81
	<u>12,282</u>	<u>20</u>	<u>1.61</u>

(Continued)



## Safety Department

## Annual Report

Year 1954

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
1911 - 1954	127,842	233	1.82

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, 1954

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 .....	16	
	Premature Blast .....	3	
	Fall Of Ground Or Timber Due To A Blast .....	4	
	Overcome By Gas .....	3	
	Miscellaneous Causes .....	<u>2</u>	28
D.	<u>Mine And Railroad Cars:</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	
	Miscellaneous Causes .....	<u>1</u>	38
E.	<u>Miscellaneous Causes:</u>		
	Falling In Raise, Stope Or Pocket .....	10	
	Electric Shock .....	12	
	Falling From Ladder, Trestle, Etc. ....	8	
	By Moving Machinery .....	8	
	Mine Fires .....	3	
	Stockpile Slide .....	3	
	Slipping And Falling .....	1	
	Miscellaneous Causes .....	<u>5</u>	50
	TOTALS .....		<u>354</u>

Safety Department

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11. ACCIDENTS  
AND  
PERSONAL  
INJURY

a. Fatal Accidents (Continued)

TABLE III

CLASSIFICATION OF FATAL ACCIDENTS - 1911 TO 1954, INCLUSIVE  
BY THE CENTRAL SAFETY COMMITTEE

I.	<u>Trade Risk</u> .....		125
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) .....	1	36
III.	<u>Negligence Of Workmen</u>		
	A. <u>Injured Men:</u>		
	Improper Act Or Improper Method Of Work .....	28	
	Violation Of Rules .....	10	
	Failure To Use Tools Or Appliances Provided .....	4	
	Failure To Use Safety Devices .....	4	46
	B. <u>Other Men:</u>		
	Improper Act Or Improper Method Of Work .....	14	
	Violation Of Rules .....	4	
	Failure To Use Tools Or Appliances Provided .....	1	19
	A.B. <u>Injured Men And Other Men:</u>		
	Improper Act Or Improper Method Of Work .....	3	3
II.-5,	III A 3, Failure To Instruct Men By Foreman And Violation III B 3 Of Rules By Injured Man And Partner .....	1	1
II.-5,	III A 4, Failure To Instruct Men As To Method Of Work And III B 4, Improper Method Of Doing Work By Injured Workman And Other Workman .....	2	2
II.-2,	III A 2, Failure To Use Proper Tools Or Appliances III B 2, Provided (By The Foreman, Injured Workman And Other Workman .....	1	1
	TOTALS .....		233

## Safety Department

## Annual Report

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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 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.

## Safety Department

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Year 1954

11. ACCIDENTS  
AND  
PERSONAL  
INJURYb. All Injuries (Continued)

During 1954 we established the best severity rating in the history of the company. We had ninety-nine (99) compensable injuries and sixty-seven (67) non-compensable lost-time injuries, for a frequency of 23.45 and a severity of 0.946. This total of one hundred sixty-six (166) lost-time injuries compares with two hundred thirty-one (231) lost-time injuries during 1953.

The frequency-severity rate table shows some very interesting figures for the various properties. The Cambria-Jackson Mine had the best severity rating for underground mines and the Agnew Mine follows in number two position with a fraction of a percentage point higher. Of the nine underground mines, five had severity rates under one.

Of the open-pit group, three mines had no lost-time injuries; seven of the nine active properties had severity rates under one. The average severity rate for all open pit operations is 0.592.

Of the five units listed in the miscellaneous group, four had no lost-time injuries. The Storehouse & Shops of this group had the only lost-time injuries and a severity rating of 0.079. Average severity for the group is 0.021.

These figures are a challenge for 1955.

021  
SEARCHABLE  
CITIZEN BOND

TABLE IV  
CLASSIFICATION OF COMPENSABLE INJURIES

CLASSIFICATION	AGNEW	BUNKER HILL	CAMBRIA-JACKSON	CANISTEO	CLIFFS SHAFT	ELEC. POW. DIV.	HAWKINS	HILL-TRUMBULL	HOLMAN CLIFFS	HUMBOLDT	LLOYD	MAAS	MATHER MINE, "A" SHAFT	MATHER MINE, "B" SHAFT	MISCELLANEOUS	OHIO	REPUBLIC	SARGENT	SPIES-VIRGIL	STHSE. & SHOPS	TILDEN	WANLESS	TOTAL	
I. <u>Trade Risk, Incidental And Non-Preventable</u>		2		3					2	3		3		5				1	2					21
II. <u>Negligence Of Company:</u>																								
1. Failure To Use Safety Devices Provided																								0
2. Failure To Use Proper Tools Provided																								0
3. Violation Of Rules																								0
4. Improper Act Or Selec- tion Of Method Of Doing Work (By Foreman)																								0
5. Failure To Instruct Men As To Hazards, Method, Etc.																								0
6. Failure To Provide Safety Devices																								0
7. Failure To Provide Tools, Appliances Or Places To Work					1																			1
III. <u>Negligence Of Workman:</u>																								
A. <u>Injured Workman</u>																								
1. Failure To Use Safety Devices Provided												1												1
2. Failure To Use Proper Tools, Etc. Provided					1								1	1										3
3. Violation Of Rules												1	1	1										3
4. Improper Act Or Method Of Doing Work		4	3	6	3	1		1	2	2	10	21						1	1					55
B. <u>Other Workman</u>																								
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											2											3

b. All Injuries  
  
(Continued)

11. ACCIDENTS  
AND  
PERSONAL  
INJURY

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TABLE IV (Continued From Previous Page)

CLASSIFICATION OF COMPENSABLE INJURIES

COMBINED CLASSIFICATIONS	AGNEW	BUNKER HILL	CAMBRIA-JACKSON	CANISTEO	CLIFFS SHAFT	ELEC. POW. DIV.	HAWKINS	HILL-TRUMBULL	HOLMAN CLIFFS	HUMBOLDT	LLOYD	MAAS	MATHER MINE, "A" SHAFT	MATHER MINE, "B" SHAFT	MISCELLANEOUS	OHIO	REPUBLIC	SARGENT	SPIES-VIRGIL	STHSE. & SHOPS	TILDEN	WANLESS	TOTAL	
III-A-4 and III-B-4	1		1						1				2											5
III-B-4 and II-4		1																						1
II-4 and II-7				1																				1
III-A-4 and II-6			1																					1
II-7 and I						1																		1
III-B-4 and III-A-1										1														1
III-A-4 and III-A-2													1											1
III-A-4 and III-A-3														1										1
TOTALS *	0	8	1	5	12	0	4	1	0	4	6	4	18	31	0	0	0	1	3	1	0	0		99

b. All Injuries (Continued)

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\* Totals are for this page and previous page

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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>
1935	2	196,883	1,136,215
1936	2	283,945	1,850,898
1937	1	765,702	5,216,879
1938	3	163,434	385,954
1939	1	564,433	3,713,389
1940	5	142,878	1,156,387
1941	5	182,340	1,456,528
1942	2	512,356	3,808,258
1943	4	269,351	1,624,315
1944	3	331,090	1,995,787
1945	1	915,666	5,970,577
1946	0	747,079 *	4,416,253 **
1947	7	153,031	1,130,679
1948	3	386,965	2,869,090
1949	1	1,013,442	7,162,324
1950	5	233,060	1,647,066
1951	2	679,740	4,507,045
1952	5	239,483	1,493,841
1953	2	617,377	4,482,063
1954	0	884,848 *	6,280,483 **
TOTALS	54	16,773,045	123,262,482
20 Year - Average	2.70	310,612	2,282,639

\* Man-Days Worked During Year Without Fatality

\*\* Amount Of Ore Mined During Year Without Fatality



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(Continued)

TABLE VI

RESUME OF ALL LOST TIME INJURIES & FATALITIES

<u>Mine Or Plant</u>	<u>Less Than 7 Days</u>	<u>7 Days Or More</u>	<u>Fatalities</u>	<u>TOTAL</u>
AGNEW	7	0		7
BUNKER HILL	6	8		14
CAMBRIA-JACKSON	3	1		4
CANISTEO	0	5		5
CLIFFS SHAFT	5	12		17
ELEC. POWER DIV.	0	0		0
HAWKINS	4	4		8
HILL-TRUMBULL	1	1		2
HOLMAN CLIFFS	1	0		1
HUMBOLDT	0	4		4
LLOYD	7	6		13
MAAS	7	4		11
MATHER MINE, "A" SHAFT	12	18		30
MATHER MINE, "B" SHAFT	12	31		43
MISCELLANEOUS	0	0		0
MISCELLANEOUS - HIBBING	0	0		0
OHIO	0	0		0
REPUBLIC	0	0		0
RESEARCH LABORATORY	0	0		0
SARGENT OPEN-PIT	0	1		1
SPIES-VIRGIL	1	3		4
STHSE. & SHOPS	1	1		2
TILDEN	0	0		0
WANLESS	0	0		0
TOTALS	67	99	0	166

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(Continued)

TABLE VII

CAUSES OF COMPENSABLE INJURIES -- UNDERGROUND

CAUSE	AGNEW	BUNKER HILL	CAMBRIA-JACKSON	CLIFFS SHAFT	LLOYD	MAAS	MATHER MINE, "A" SHAFT	MATHER MINE, "B" SHAFT	SPIES-VIRGIL	TOTAL	
Fall Of Ground		2		1				6		9	
Falling Chunks (Shafts, Chutes, Raises)		1		1		1		1		4	
Rolling Chunks				1	1			2		4	
Persons Falling (Raises, Shafts, Scaffolds)							1	2		3	
Persons Falling (Slipping & Stumbling)				1			5	3		9	
Haulage		1		1		1	1	2		6	
Drilling Equipment		1					2	6		9	
Loading Equipment		1					1	1		3	
Machinery (Moving)										0	
Hand Tools						1	2			3	
Flying Objects								1	1	2	
Handling Materials		1					3	1	1	6	
Lifting Or Pulling		1						1	1	3	
Falling Or Moving Material				1			2			3	
Cages And Skips				1						1	
Bumping Against Objects								1		1	
Moiling Chunks					1			1		2	
Miscellaneous				2			1	2		5	
TOTALS		0	8	0	9	2	3	18	30	3	73