

MAAS MINE
ANNUAL REPORT
YEAR 1954

3. ANALYSISa. Average Mine Analysis on Output

<u>Grade</u>	<u>1954</u>				<u>1953</u>			
	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Sul.</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Sul.</u>
Maas	57.69	.104	8.33	.251	57.99	.104	8.85	.183
Race Course	57.80	.101	7.97	.283	58.22	.098	8.17	.230

b. Average Mine Analysis on Ore Shipped

<u>Grade</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss</u>	<u>Moist</u>
Maas	57.75	.105	8.36	.24	3.36	0.99	.43	.258	2.56	12.99
Race Course	57.04	.126	8.61	.24	3.52	1.14	.55	.250	2.92	12.99

c. Average Natural Analysis of Ore in Stock - December 31, 1954

<u>Grade</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Lime</u>	<u>Mag</u>	<u>Sul.</u>	<u>Loss</u>	<u>Moist</u>
Maas	285,863	50.21	.091	7.47	.21	2.92	.86	.37	.217	2.23	12.99
Race Course	48,907	50.44	.085	6.92	.21	3.06	.99	.48	.258	2.45	12.99

d. Straight Cargo Shipments

<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Sul.</u>	<u>Moist</u>
19,147	57.85	.109	8.54	.247	12.85

4. ESTIMATE AND ANALYSIS OF ORE RESERVES

An increase of approximately 333,000 tons was shown in proven ore reserves, as reported to the Tax Commission, after production for the year had been deducted. Almost the entire amount was found in the Mulvey Lease in a drilling campaign carried on from November, 1953 to June, 1954 at the west end of the 7th Level. Some new ore was found in the Maas Lease in the same area but, this was more than offset by unavailable ore remaining along the flat foot wall after mining operations had been completed in various contracts above 4th and 5th Levels. Some new ore was found in the City of Negaunee Lease as the foot wall contact was located at a lower elevation than originally assumed.

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4. ESTIMATE AND ANALYSIS OF ORE RESERVES - Continued

Statement of Reserves

	<u>Maas Lease</u>	<u>Race Course Lease</u>	<u>City of Negaunee Lease</u>	<u>Mulvey</u>	<u>Total Mine</u>
Reserves 12-31-53	3,562,622	237,342	12,126	- -	3,812,090
Produced 1954	339,802	48,320	12,995	- -	401,117
Former Reserves 12-31-54	3,222,820	189,022	- 869	- -	3,410,973
Reserves 12-31-54 (Based on report to the Tax Commission)	3,165,763	181,566	19,598	374,322	3,741,249
Increase in Reserves			20,467	374,322	330,276
Decrease in Reserves	57,057	7,456			

Expected Average Natural Analysis of Ore Reserves

(Based on report to Tax Commission 12-31-54)

<u>Grade</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Sil.</u>	<u>Mang</u>	<u>Alum</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss</u>	<u>Moist.</u>
Maas	3,559,683	51.00	.092	8.10	0.18	2.45	0.57	.120	.220	1.43	13.50
Race Course	181,566	51.00	.092	8.10	0.18	2.45	0.57	.120	.220	1.43	13.50

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5. LABOR AND WAGES

Labor Relations

Labor relations were good during the year. All grievances were settled before they were reduced to writing, with most of them being settled by the supervisors.

Employment

No. employed 1-1-54	376
Added during year	10
Separations	16
Laid-off - curtailment of operations	81
No. employed 12-31-54	289

The separations reported above were for the following reasons:

Quit	1
Transferred	1
Drafted or enlisted	1
Retired at age 65 or more	6
Discharged	2
Retired - medical reasons	2
Deceased	3
Total	<u>16</u>

The average age of the mine employees is 47.4 years. There are 17 men still employed at the end of the year who are 65 years of age or more.

The mine ceased production for a 2-week vacation period during the latter half of July. A total of 347 men received an average of 2.29 weeks vacation pay based on a 40-hour week.

Labor Statement - December 1954

Average No. Employed	291
Average Daily Absenteeism	18
	—
Average No. Men Working	273

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5. LABOR AND WAGES - ContinuedWages

There was a general increase of 5 cents per hour effective July 1, 1954 to the basic hourly wage rates. This increase was also applied to the incentive rates as an add-on even though we were not obligated by the contract to do so.

Statement of Wages

	<u>1954</u>	<u>1953</u>	<u>Increase</u>	<u>Decrease</u>
<u>Average Wages Per Day</u>				
Surface	17.00	15.49	1.51	--
Underground	20.67	19.94	.73	--
Total	19.87	19.11	.76	--
<u>Average Wages Contract Labor</u>	22.01	20.38	1.63	--
<u>Average Wages Per Month</u> (17.4 Days Per Month) (8.2 Shifts Per Week)				
Surface	295.80	317.55	--	21.75
Underground	359.66	408.77	--	49.11
Total	345.74	391.76	--	46.02
<u>Product Per Man Per Day</u>				
Surface	26.98	33.14	--	6.16
Underground	7.47	7.61	--	.14
Total	5.85	6.19	--	.34
<u>Labor Cost Per Ton</u>				
Surface	.630	.468	0.162	--
Underground	2.768	2.619	0.149	--
Total	3.398	3.087	0.311	--

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6. SURFACE

Construction

The erection of an addition to the underground dry building, started in 1953, was completed in January. The building provides change rooms for the captain, foreman, engineers and shift bosses. The former shift bosses' room was altered slightly to serve as first aid quarters.

A complete renovation of the mine office was carried out during the first part of the year. The former mine captain's office and change rooms were combined with a new addition, built in 1953, to form a large general office and payroll room. Separate office rooms were provided for the superintendent, mine clerk and engineers.

In the underground dry, the lockers in the clean clothes room were replaced by chains and baskets, greatly improving the ventilation and cleanliness of the building. Other surface activities included running new fencing around the caved area, repairing the sheeting on the headframe and laying new steam and condensate return lines between the surface buildings.

Equipment

In June, small cracks found in the spiders of the skip hoist drum were repaired by a "metal locking" process. Also, some cracks in the compressor frames were repaired.

During the vacation period, a new gear and pinion were installed on the skip hoist. The old gear had worn loose on the main shaft and some teeth were chipped. Later, new bearing shells were placed in the pinion bearings and the gear and pinion realigned.

Drainage

The settling area northwest of the Carp River was used to collect the pump discharge water throughout the year. The water was effectively cleaned in this manner before entering the Carp River.

Purchase and Disposal of Dwellings

The following houses and lots were purchased by the Mining Department during 1954. All are located in the Pioneer Iron Co. Addition and will be affected by mining in the Pioneer & Arctic Lease.

N $\frac{1}{2}$ of Lot 7, Block 35 - 1 house
 Lot 2, Block 35 - 1 house
 Lot 10, Block 26 - 1 house
 Lot 1, Block 24 - 1 house
 Lot 8, Block 32 - 2 houses

One lot was cleared during the year by the razing of the Park St. School in Kirkwood and Kellan's Addition. The lot is tributary to the Maas Lease.

The surface area that is expected to be caved by mining carried out in 1954 is entirely company-owned with exception of the Kellan estate in Kirkwood and Kellan's Addition.

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7. UNDERGROUND

The movement of mining contracts from the upper levels to the 7th Level continued throughout the year with the result that 60% of the production was being obtained from that level at the end of the year. The change was accelerated by the reduction in forces during May as the proportion of men required for 6th Level drift maintenance became too great. Ten contracts mining in the pillars above 6000 Drift West, 6700 and 6800 Crosscuts were transferred to 7th Level in July, leaving only seven contracts working above 6th Level. As it was not expected that the move would be necessary for another year, most of the crews had to develop new areas before resuming mining, causing a drop in production for several months. All of the ore abandoned on 6th Level can be recovered by mining operations from 7th.

Mining by sub level caving methods contributed the major part of the production although the proportion of block cave production increased. No other method was in use during the year. The proportion of each method compared with 1953 is as follows:

	<u>1954</u>	<u>1953</u>
Sub Level Caving	81.9%	81.7%
Block Caving	18.1	13.4
Top Slicing	-	4.9

The block caves were pulled on a three-shift basis throughout the year. Since August, most of the 7th Level sub caving contracts also have worked three shifts in order to get maximum production from the available working places. The main level development headings worked either one or two shifts. During an average month, there were 23 contracts working. Of these, 10 were engaged in production, 8 in sub level cave development, 3 in block cave development and 2 in main level development.

A decrease was shown in tons per man shift, from 6.19 in 1953 to 5.85 in 1954. This is largely a result of the decrease in working force causing a higher proportion of overhead labor; also, to some extent, the high proportion of development carried out on 7th Level.

A lower silica analysis was obtained on ore produced as greater control was kept on caving contracts. The iron content decreased slightly as considerable low-silica lean ore was obtained from foot wall working places above 4th and from 7th Level development. The sulphur grade continued its steady rise corresponding to the movement of production centers to lower levels.

Main level development was concentrated on 7th Level with some raising and stripping being done on 4th and 6th Levels as well. A summary of the level development carried out in 1954 follows:

	<u>Advance in Lineal Feet</u>			
	<u>4th Level</u>	<u>6th Level</u>	<u>7th Level</u>	<u>Total</u>
Drifting			1343	1343
Raising	13	12	345	370
Stripping		950	54	1004
	-----	-----	-----	-----
Total	13	962	1742	2717

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7. UNDERGROUND - Continued

Mining above 4th and 5th Levels was carried out by four contracts in small pillars of standard ore remaining along the north and east foot walls. Because of the shallow inclination of the foot wall, transfers were necessary to reach the ore in most cases. Three contracts remained operating in this area at the end of the year.

Above the 6th Level, the 6100 Crosscut pillar was mined by three contracts throughout most of the year. The crew at the north end recovered all available ore to the foot wall and was removed from that section near the end of the year. Tonnage was obtained from the Race Course and City of Negaunee Leases as well as the Maas in this pillar.

In the central part of the 6th Level, three contracts were mining over the 6700 Crosscut until July when the west end of the level was abandoned. At the west end, five contracts worked the 6800 Crosscut pillar from the north foot wall to the Mitchell Ave. mining limit on the south. These crews also were withdrawn in July.

In the north foot wall pillar, three contracts were working on the last sub level above 6th Level. Two were withdrawn in July while the third continued mining the ore to the foot wall at the east end.

On 7th Level, four contract crews carried out sub level caving while five more completed development prior to caving at the end of the year. From the 7100 Crosscut, two working places were established just below the 6400 Crosscut. Owing to the flat foot wall, the depth of ore below 6th Level was limited and already one contract has mined out its area.

Over the 7200 Crosscut, two contracts continued recovering ore pillars left in #1 Block Cave as well as along the north edge of it. This area proved to be one of the most productive in the mine, 27,000 tons being recovered from the block and 25,000 tons from the north side. Also, in this area, two contracts drove a transfer drift and two raises to reach the ore left above the 6700 Crosscut. They were ready to commence sub caving at the end of the year.

From the 700 Drift, two long raises were driven into the Mitchell Ave. pillar above 6th Level. The foot wall ore contact was found at -130' elevation while the hanging wall was reached in one raise at -40'.

From the top of 7401 Raise in #2 Block Cave, a short transfer and a high raise were driven into the pillar between #2 Block and the north foot wall. The raise was opened up for mining on the -50 Sub Level.

Block cave production was obtained from the #2 Block, west of 7400 Crosscut and from #3 Block, located in the Mitchell Ave. Pillar. Development of a new block was started east of 7400 Crosscut and was well advanced at the end of the year.

The caving of #2 Block was not completely successful. In spite of a good undercut, the stope caved slowly and in such large chunks that a high rate of draw could not be attained. In spite of replacing most of the steel sets in the scraper drifts, some ore had to be left at the west end of the block as the drifts were closed by the pressure. The ore may be recovered from the 7500 Crosscut. An estimated recovery of 70% was obtained.

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7. UNDERGROUND - Continued

In the #3 Block, the west end was developed first. As caving conditions looked similar to the earlier block, long holes were drilled and blasted along the sides and over the back of the stope. As a result, secondary blasting has been reduced and the rate of draw increased to about 350 tons per day. Development of the second half of the block was being carried out at the end of the year.

1343 feet of main level drifting was carried out on 7th Level. The 7000 Drift extension to the west and the turn-off for 7600 Crosscut were completed. Two diamond drill stations were cut in these drifts. The 7300 Crosscut was connected between the 7000 and 700 Drifts. The first 60 feet of this drift ran through 1st class ore. A drift from the winze to the main shaft to eliminate supply handling through the winze was started in April. In July, development necessary for installation of a conveyor haulage system from 7th Level to the main shaft on 6th also was started. However, the whole program was suspended in December when the decision was made to amalgamate the Maas and Bunker-Hill surface plants at the Negaunee #3 Shaft, thus eliminating all hoisting through the Maas Shaft.

Diamond Drilling

The drilling program to outline the western extension of the Maas ore body to the 3200 W. coordinate, started in 1953, was completed in June, 1954. Three holes drilled on the 2700 W. cross section showed the ore body to extend to that point substantially unchanged in form. A build-up along the north foot wall to at least 40' elevation was indicated. The ore section was not delimited to the south and will require further drilling from the 700 Drift in order to do so. Two holes drilled along the 3000 W. cross section did not provide such satisfactory results, indicating a possible decrease in vertical depth of the ore body. However, more drilling is necessary before this fact can be substantiated.

U.H. #76 and #77 were detailed in the 1953 report. The logs of the other holes of the program follow:

U. H. #79 Collar - S 629.99 and 2698.04 W Elev. -195.55
drilled S 1° 41' W at plus 61° 30'.

0 - 39 argillite and graywacke
39 - 93 argillite
93 - 130 ferruginous argillite
130 - 155 2nd class high sulphur ore
155 - 165 1st class high sulphur ore
165 - 170 2nd class high sulphur ore
170 - 183 1st class sulphurous ore
183 - 184 intrusive
184 - 190 1st class sulphurous ore
190 - 240 1st class high sulphur ore
240 - 280 1st class standard ore
280 - 285 iron formation
Entire hole in Mulvey Lease.

U. H. #80 Collar - S 710.95 and 2996.62 W Elev. -197.02
drilled S 3° 31' E at plus 45°.

0 - 55 argillite
55 - 69 argillaceous iron formation
62 - Mulvey - Pioneer & Arctic boundary
69 - 95 1st class sulphurous ore
95 - 98 intrusive
98 - 165 1st class high sulphur ore
165 - 170 2nd class high sulphur ore
170 - 205 1st class standard ore

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7. UNDERGROUND - Continued

Diamond Drilling - Continued

U. H. #80 - Continued

205 - 230 iron formation
230 - 235 1st class standard ore
235 - 253 iron formation
253 - 261 intrusive
261 - 300 argillaceous iron formation

U. H. #81 Collar - S 711.11 and 2996.47 W Elev. -199.28
drilled S 0° 54' E at plus 18°.

0 - 45 argillite
45 - 87 argillaceous iron formation
47 - Mulvey - Pioneer & Arctic boundary
87 - 95 intrusive
95 - 100 2nd class standard ore
100 - 108 ferruginous argillite
108 - 115 2nd class standard ore
115 - 131 argillaceous iron formation
131 - 170 2nd class standard ore
170 - 214 1st class standard ore
214 - 227 intrusive
227 - 234 1st class sulphurous ore
234 - 274 argillaceous iron formation
274 - 313 iron formation

U. H. #78 was drilled south from the 700 Drift along the 2400 W. cross section to test a geological premise that a syncline favorable for ore concentration lay to the south of an anticline which apparently has cut off the ore extending to the south. However, the hole did not get out of the foot wall although reaching an elevation of -55'. The log follows:

U. H. #78 Collar - S 970.05 and 2414.44 W Elev. -208.70
drilled S 4° 15' E at plus 17° 10'.

0 - 30 ferruginous argillite
30 - 50 2nd class high sulphur ore
47 - Maas - Pioneer & Arctic boundary
50 - 115 ferruginous argillite
115 - 164 argillaceous iron formation
164 - 165 2nd class standard ore
165 - 205 argillaceous iron formation
205 - 218 ferruginous argillite
218 - 235 argillaceous iron formation
235 - 237 1st class standard ore
237 - 255 2nd class standard ore
255 - 523 argillaceous iron formation
523 - 579 iron formation

The classification of ore in the preceding logs is made according to the following table:

1st class ore - over 57.50% iron (Dry)
2nd class ore - 50.00% to 57.50% iron
standard ore - below .050% sulphur
sulphurous ore - .050% to .250% sulphur
high sulphur ore - over .250% sulphur

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7. UNDERGROUND - ContinuedTimber Statement

<u>Kind</u>	<u>1954</u>			<u>1953</u>	
	<u>Lineal Feet</u>	<u>Avg. Price Per Ft.</u>	<u>Total Cost</u>	<u>Avg. Price Per Ft.</u>	<u>Total Cost</u>
Cribbing	36,863	.0853	\$ 3,144.39	.0948	\$ 6,276.34
Stulls	67,070	.3237	21,707.71	.2409	30,287.53
Lagging	774,441	.0215	16,657.25	.0216	27,447.38
Poles	332,127	.0396	13,152.69	.0392	19,682.09
Norm. Steel Sets	12,966	.9686	12,558.33	.8790	25,807.83
Cir. Steel Sets	7,529	2.6250	19,764.03	1.9830	10,977.88
Total			\$ 86,984.40		\$ 120,479.05
Cost per ton - Product			.217		.205

Explosives Statement

	<u>1954</u>			<u>1953</u>	
	<u>Quantity</u>	<u>Avg price Per Lb.</u>	<u>Total Cost</u>	<u>Avg Price Per Lb.</u>	<u>Total Cost</u>
Gelamite 1X (1½" x 8")	135,700	.1748	\$ 23,723.32	.1727	\$ 35,911.90
60% Gelatin (5" x 5")	500	.2115	105.75	.2303	3,317.00
60% Gelatin (4" x 2")	14,400	.2370	3,412.15		
Hercomite #2 (1½" x 24")	31,075	.1673	5,197.87	.1670	5,719.02
Total	181,675	.1786	\$ 32,439.09	.1752	\$ 44,947.92
Other Blasting Supplies			11,580.36		13,359.60
Total all Explosives			\$ 44,019.45		\$ 58,307.52
Cost Per Ton - Product			.1097		.0993

Ventilation

Rehabilitation of #2 Negaunee Air Shaft was the feature of the ventilation program during 1954. Work on this project, started in 1952, was resumed in July, 1954, after a fall of timber had plugged the shaft. Commencing at the end of the steel previously installed, steel sets were placed inside the timber and lined with hardwood plank over a distance of 420 feet. A second fall of timber also had to be cleaned out. About 60 feet of shaft remained unrepaired at the end of the year.

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7. UNDERGROUND - Continued

Ventilation

The auxiliary ventilating fan, located on the Bunker-Hill 5th Level at #3 Shaft, was equipped with a Vee-belt drive in place of a flat belt. The change required the pouring of a new motor base. This fan was used as a main ventilation supply from June until the end of the year.

A two-man crew continued to repair the Negaunee Mine airways throughout most of the year. Steel sets were installed to help support the old timber sets on the levels while new timber was placed in the raises where necessary.

Pumping

No important changes were made in the pumping set-up during the year. Frequent and extensive repairs, however, were necessary to keep the system operating. Specifications for an automatic pumping system were drawn up but the plan was abandoned in favor of pumping through the Bunker-Hill shaft after the proposed connection is made.

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8. COST OF OPENING, EQUIPPING, DEVELOPING, AND OPERATING

Comparative Mining Costs

	<u>1954</u>	<u>1953</u>
Product	401,117	587,016
Underground Costs	3.616	3.438
Surface Costs	.478	.389
General Mine Expense	.952	.708
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Cost of Production	5.046	4.535
Depletion - Original Cost	.025	.024
Depreciation		
Plant & Equipment	.051	.041
Development	.038	.028
Movable Equipment	.008	.007
Taxes	.391	.287
Loading and Shipping	.043	.082
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Total Cost At Mine	5.602	5.004
Budget - Estimated Cost Per Ton	5.731	5.349

Number of Days Operated

1-8 Hour		2
2-8 Hour	209	247
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Total	209	249

<u>Proportion of Labor and Supplies</u>	<u>1954</u>	<u>%</u>	<u>1953</u>	<u>%</u>
Labor Cost per Ton	3.651	65.2%	3.310	66.1%
Supplies	1.951	34.8%	1.694	33.9%
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Total Cost Per Ton	5.602	100.0%	5.004	100.0%

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8. COST OF OPERATINGDetailed Cost Comparison

		<u>1954</u>		<u>1953</u>	
	<u>Amount</u>	<u>Per</u>	<u>Amount</u>	<u>Per</u>	
		<u>Ton</u>		<u>Ton</u>	
<u>Underground Costs:</u>					
Development	\$ 126,976.36	.317			
Mining	536,172.56	1.336			
Tramming	283,971.51	.708			
Auxiliary Hoisting	43,339.53	.108			
Ventilation	68,619.31	.171			
Pumping	87,343.83	.218			
Compressors & Air Pipes	43,008.43	.107			
U.G. Superintendence	99,491.49	.248			
Maint. Pockets & Chutes	3,465.24	.009			
" Mining Equipment	58,877.37	.147			
" Levels & X-Cuts	80,013.03	.199			
" Shaft	19,212.48	.048			
	<hr/>				
Total Underground Costs	\$ 1,450,491.14	3.616	\$ 2,018,252.35	3.438	
<u>Surface Costs:</u>					
Hoisting	\$ 77,590.70	.194			
Crushing & Screening	229.74	.001			
Stocking	36,157.04	.090			
Timber Yard	24,420.39	.061			
Dry House	17,040.28	.042			
Policing	14,006.60	.035			
General Surface	3,638.77	.009			
Maint.-Head Fr. Bldg. & Eqpt.	3,458.74	.008			
" Other Mine Buildings	15,276.64	.038			
	<hr/>				
Total Surface Costs	\$ 191,818.90	.478	\$ 228,128.92	.389	
<u>General Mine Expenses:</u>					
Geological Department	\$ 5,478.96	.014			
Mining Engr. Department	20,240.61	.051			
Mech. & Elect. Eng. Dept.	15,164.04	.037			
Safety Department	5,106.52	.012			
Research Laboratory	576.73	.002			
Analysis & Grading Laboratory	23,210.26	.058			
" " Shipping	4,956.78	.013			
Telephones & Safety Dev.	13,202.91	.033			
Welfare - General	2,782.44	.007			
" - District	264.82	.001			
Spec. Expense - Pensions	80.05				
" - Retirements	4,357.97	.011			
" - Legal	2,844.15	.007			
" - Hygiene Clinic	5,929.98	.014			
" - Empl. Office	1,313.74	.003			
" - Other					
Ishpeming Office	51,518.32	.129			
Mine Office - Supt. & Clerks	42,435.84	.106			

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8. COST OF OPERATING - Continued

	<u>1954</u>	<u>Per</u>	<u>1953</u>	<u>Per</u>
	<u>Amount</u>	<u>Ton</u>	<u>Amount</u>	<u>Ton</u>
Central Warehouse Overhead	\$ 13,358.67	.033		
Insurance - Property	1,823.49	.005		
" - Group, Health & Life	15,692.62	.039		
" - Group Annuity	10,959.84	.027		
" - Catastrophe	3,181.99	.008		
Personal Injury - Comp. & Doctors	11,376.27	.028		
" " - Comp. Dept.	2,241.60	.006		
Vacation Pay - Current Year	71,959.22	.179		
" " - Prior Year Adj.	15,180.00	.038		
Holiday Allowance	29,626.72	.074		
Taxes - Unemployment Insurance	13,439.69	.034		
" - Old Age Benefit	23,683.41	.059		
Design Dept.	123.56			
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Total General Mine Expenses	\$ 381,751.20	.952	\$ 415,897.43	.708
Total Cost of Production	\$ 2,024,061.24	5.046	\$ 2,662,278.70	4.535

Ventilation

Includes \$ 33,000 of labor and supplies for #2 Air Shaft Repair.

Hoisting

Includes \$ 14,400 unusual expense for new skip hoist gear and pinion, repair of cracks in drum spiders and construction of new double deck cage.

Other Mine Buildings

Includes \$ 5,300 for renovation of mine office building.

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8. COST OF OPENING, EQUIPPING, DEVELOPING, AND OPERATING - Continued

E & A CC-285 Development of 7th Level

This E. & A., originally approved to cover the deepening of the winze to 7th Level and the development of that level to the 2400 W. coordinate, was extended to cover further development to the 3200 W. coordinate. On completion of this work in March, 1954, a supplemental appropriation of \$72,650 was made to cover the extra development and to close out the E. & A.

E & A CC-633 Main Level (7th) Development

This appropriation was approved in April, 1954, to cover 7th Level development for the balance of 1954. However, completion of the main item, a connection between the main shaft and winze was not completed due to the cut-back in labor. The 7300 Crosscut was driven in place of the 7500 to permit immediate development of ore pillars abandoned on 6th Level at the time of the lay-off.

The condition of the E. & A. at the end of 1954 follows:

<u>Detail</u>	<u>Amount Authorized</u>	<u>Total Expenditure To Date</u>	<u>Unexpended Balance</u>
7th Level main line drift - 960'	57,600.00	8,966.41	48,633.59
7500 Crosscut - 180'	14,400.00	- - - -	14,400.00
Raises & Transfers	13,200.00	20,877.43	7,677.43
7300 Crosscut - 320'	- - - -	16,039.87	16,039.87
Social Security Taxes	- - - -	741.66	741.66
Mining Engineers	- - - -	334.46	334.46
Total	85,200.00	46,959.83	38,240.17

E & A CC-552 Diamond Drilling Underground

This E. & A., to the amount of \$35,000.00 to cover the underground diamond drilling from November, 1952, to the end of 1954, was overexpended by \$2,874.75 at the end of the year with the program completed.

E & A CC-567 Addition to Dry House

This E. & A. was approved in July, 1953, to cover construction of an addition to the underground dry house, providing quarters for the captain, bosses and engineers, as well as making minor changes in the old dry. With the work completed in December, 1954, there was a balance of \$2,735.60 left unexpended.

MAAS MINE
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8. COST OF OPENING, EQUIPPING, DEVELOPING, AND OPERATING - Continued

E & A CC-632 Air Shaft Repairs

An amount of \$25,000.00 was approved to complete repair of the Negaunee #2 Air Shaft. Due to additional labor necessary when the old shaft timber collapsed on two separate occasions, the E. & A. was overexpended at the end of the year by \$7,828.47 with about one month's work still necessary to complete the project.

E & A CC-640 Automatic Pumping System

This E. & A., approved in September, 1954, was later withdrawn when the proposed consolidation with Bunker-Hill Mine made the expenditure unnecessary. Only a small amount of preparatory work was done.

E & A CC-641 Conveyor Installation

Approval was given in July, 1954, for the development and installation of conveyor haulage from 7th Level to the main shaft on 6th Level. An expenditure of \$43,977.17 for necessary drift development was made before the E. & A. was cancelled due to the Maas-Bunker Hill amalgamation.

9. TAXES

	<u>1954</u>		<u>1953</u>	
	<u>Valuation</u>	<u>Taxes</u>	<u>Valuation</u>	<u>Taxes</u>
Maas Mine	\$2,565,000	\$114,091.20	\$2,765,000	\$128,157.75
Race Course	230,000	10,230.40	300,000	13,905.00
Stockpile & Equipment	685,000	30,468.80	525,000	24,333.75
Miscellaneous Parcels	11,930	530.65	11,930	553.00
	<hr/>	<hr/>	<hr/>	<hr/>
Total Oprtg. Maas Mine	\$3,491,930	\$155,321.05	\$3,601,930	\$166,949.50
Collection Fees		1,553.21		1,669.50
		<hr/>		<hr/>
Total		\$156,874.26		\$168,619.00
Tax Rate		4.448		4.635
Total City of Negaunee		\$848,592.33		\$833,573.05
Maas Mine % of City Tax		18.5%		20.0%
Maas Mine Rented Houses	\$108,880	\$4,842.98	\$99,575	\$4,615.34
Mineral Lands, etc.	13,310	592.03	13,310	616.93
	<hr/>	<hr/>	<hr/>	<hr/>
Total Houses and Lands	\$122,190	\$5,435.01	\$112,885	\$5,232.27
Collection Fees		54.35		52.32
		<hr/>		<hr/>
Total		\$5,489.36		\$5,284.59

MAAS MINE
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10. ACCIDENTS AND PERSONAL INJURY

There were 4 compensable accidents reported in 1954 compared with 19 in 1953. This is the lowest number reported in any year since 1934. However, three of the accidents were serious, giving the mine a high severity rating. Brief descriptions of each accident follows:

<u>Date</u>	<u>Employee Injured</u>	<u>Injury</u>
Jan. 29	Jack Lintula	Loss of sight in right eye
Feb. 10	Gordon Phillips	Fracture in left foot
Feb. 22	John Campagnola	Fractured left thumb
Aug. 17	Richard Toms	Lacerated wrist

The accident statistics compiled by the Safety Department show the following rates for the Maas Mine:

<u>Year</u>	<u>Frequency</u>	<u>Severity</u>
1954	19.51	3.420
1953	31.83	.731
1952	47.24	8.547
1951	39.56	.379
1950	45.57	7.743

11. POWER

In December, 1953, the mine started to buy electric power from the U.P. Power Co. which had taken over the transmission lines and customers of the Cliffs Power & Light Co. The cost of power used during 1954 compared with the previous year follows:

	<u>1954</u>	<u>1953</u>
Total Kwh used	8,796,721	9,936,000
Total cost of power	\$83,548.01	\$157,073.17
Cost per Kwh	\$0.00950	\$0.01581
Cost per ton product	\$0.208	\$0.268

MATHER MINE "B" SHAFT
ANNUAL REPORT
YEAR 1954

1. GENERAL:

Production from Mather Mine "B" Shaft for 1954 continued high in spite of the reductions in working force and schedule incurred during the months of April and May. Achievement of the high production for the remainder of the year under these adverse conditions is indicative of the excellent state of development that had been attained at the mine.

The production for the year totaled 909,351 tons. Of this tonnage, 267,314 tons were produced from 6th Level; 500,789 tons from 7th Level; and 141,248 tons from 8th Level.

Average Mine Analysis on Output: (Incl. Stockpile)

<u>Grade</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Sulphur</u>
Mather Standard	58.56	.099	9.30	.043
Mather Special	57.16	.100	8.43	1.071

Again this year, as in 1953, new production records were attained at the mine. The previous record hoist of 6,031 tons in twenty-four hours, established in 1953, was exceeded on March 8th, 1954, when 6,146 tons were hoisted. This in turn was surpassed on March 29th when 6,307 tons were hoisted. The old record of 188 skips for one shift was also exceeded during the year. A total of 203 skips were hoisted during one shift on March 15th and on April 5th the present record of 214 skips was attained.

The shipping season was somewhat shortened this year due to a slow iron ore market. The season opened April 22nd and closed November 15th. Shipments from the stockpile and pocket totaled 860,996 tons of high grade ore.

Average Analysis of Shipments: (Total Average)

<u>Grade</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Sulphur</u>
Mather Standard	58.40	.091	9.86	.040
Mather Special	56.58	.092	8.60	1.040

In spite of increases in labor and supply costs as well as a sizeable cutback in production during 1954, it was possible to maintain very good costs on ore mined. The Cost of Production increased only \$0.006 per ton over 1953 and the Total Cost at Mine decreased \$0.401. Part of this difference is accounted for in Allowance Under Section 309, and Amortization of Defense Facilities. The former has no entry in the cost sheet this year and the latter increased \$0.097 over 1953. Allowance Under Section 309 and Amortization of Defense Facilities are not included in Budget - Estimated Cost Per Ton.

Labor relations at the mine were satisfactory throughout the year. One grievance, which extended over from 1953, was dropped in Step 4 by the Union.

Manpower, both skilled and unskilled, due to the reduction in working force, was no problem in 1954.

MATHER MINE "B" SHAFT
ANNUAL REPORT
YEAR 1954

1. GENERAL: (Cont'd)

Pumping operations got underway in the project for dewatering the old underground workings of the Sand and North Shafts in the North Jackson Pit area. The pumping was started in November and will continue into 1955.

The Mather Mine "A" Shaft crew continued driving the 5th Level main heading toward "B" Shaft until the drifting was temporarily stopped due to an urgent need for this crew to extend a cross-cut on 8th Level. The drifting during the year on the 5th Level totaled 753' which advanced this heading to 400' from the "B" Shaft 5th Level cutout.

Drifting continued on the 8th Level main line with one crew during the year. This drift connected with the "A" Shaft heading on December 22nd. The connection was made 2,400' on the "A" Shaft side of the boundary between the two properties. The total drifting for the year on this level, including cross-cutting, was 3,275'.

The 8th Level conveyor drift was completed and work was started on the crusher box installation.

The work on 9th Level consisted of opening up the cage plat and cutting out a sub-station at the plat. The entire plat was rock bolted as it was being opened.

On 10th Level the drifting totaled 1,013'. In the first part of the year the drift was driven 9' x 11' in size and in the last quarter of the year it was enlarged to 9' x 15' to facilitate the conveyor that will be installed in this portion of the drift. Of added interest on 10th Level this year is the successful application of roof bolting as an inexpensive means of support. Work was continued in the 10th Level Pumphouse. The installation of a 500 G.P.M. Worthington Pump was completed and work progressed towards the future installation of a 500 G.P.M. centrifugal pump.

As in 1953, steel continued to be used as the dominant method of ground support. Roof bolting was introduced during the year and proved successful in the footwall drifts. A total of 4,411 bolts were installed.

The ore reserves were increased during the year by approximately three million tons. This represents the proven increase in reserves as reported to the State Tax Commission. However, it is felt that the ore structures proven below 8th Level indicate that a substantial tonnage of high grade ore will be available to 9th and 10th Levels. The upper levels, 5th, 6th and 7th, showed a reduction in tonnage which can be attributed to the year's production. Exploration was concentrated on outlining the 8th, 9th and 10th Level reserves. The results show an increase of two million tons in the 8th Level reserves and another two million tons available below 8th Level.

MATHER MINE "B" SHAFT
ANNUAL REPORT
YEAR 1954

2. PRODUCTION
SHIPMENTS &
INVENTORIES:

a. Production by Grade and Months:

	<u>Standard</u>	<u>Special</u>	<u>Total Tons</u>	<u>Rock</u>
January	50,922	30,455	81,377	15,396
February	33,937	40,718	74,655	13,002
March	66,305	51,219	117,524	13,560
April	59,930	31,087	91,017	9,420
May	48,858	20,250	69,108	8,016
June	57,405	13,359	70,764	8,424
July	30,138	4,088	34,226	4,608
August	56,586	12,602	69,188	9,972
September	61,653	8,613	70,266	8,928
October	53,772	15,327	69,099	8,317
November	57,866	7,428	65,294	9,084
December	67,838	5,940	73,778	8,244
Total	645,210	241,086	886,296	116,971
After Stockpile Transfer	- 3,173	+ 3,173		
Overrun		23,055	23,055	
Total	642,037	267,314	909,351	

b. Shipments:

	<u>Pocket Tons</u>	<u>Stockpile Tons</u>	<u>Total Tons</u>	<u>Total 1953</u>	<u>Increase or Decrease</u>
Mather Standard	353,628	240,540	594,168	645,707	51,539
Mather Special	1,870	264,958	266,828	413,297	146,469
Total	355,498	505,498	860,996	1,059,004	198,008

c. Ore Statement:

	<u>1954</u>	<u>1953</u>
On Hand January 1, 1954	179,041	157,895
Output For Year	886,296	1,080,150
Overrun	23,055	-
Total	1,088,392	1,238,045
Shipments	860,996	1,059,004
Balance on Hand	227,396	179,041
Decrease in Output	193,854	459,432
Increase in Ore on Hand	48,355	21,146

MATHER MINE "B" SHAFT
ANNUAL REPORT
YEAR 1954

2. PRODUCTION
SHIPMENTS &
INVENTORIES: (Cont'd)

c. (Cont'd)

Working Schedule:

1954 - Five 3-8 hr. shifts from January 1, 1954 to March 31, 1954. Four 3-8 hr. shifts from April 1, 1954 to May 14, 1954. Four 2-8 hr. shifts from May 15, 1954 to December 31, 1954.

1953 - Five 3-8 hr. shifts from January 1, 1953 to December 31, 1953.

1952 - Five 3-8 hr. and one 2-8 hr. shifts per week from January 1, 1952 to May 31, 1952. Five and one-half 3-8 hr. shifts per week from June 1, 1952 to November 16, 1952. Five 3-8 hr. shifts per week from November 17, 1952 to December 31, 1952.

1951 - Five 3-8 hr. and one 2-8 hr. shifts per week from April 1, 1951 to December 31, 1951.

1950 - Five 3-8 hr. shifts per week from July 1, 1950 to August 20, 1950. Six 3-8 hr. shifts per week from August 21, 1950 to December 31, 1950.

d. Division of Product by Levels and by Months:

	6th Level	7th Level	8th Level	Total Tons	
	<u>Special</u>	<u>Standard</u>	<u>Standard</u>	<u>Standard</u>	<u>Special</u>
January	30,455	48,375	2,547	50,922	30,455
February	40,718	30,302	3,635	33,937	40,718
March	51,219	61,663	4,642	66,305	51,219
April	31,087	50,842	9,088	59,930	31,087
May	20,250	35,200	13,658	48,858	20,250
June	13,359	40,717	16,688	57,405	13,359
July	4,088	21,159	8,979	30,138	4,088
August	12,602	37,913	18,673	56,586	12,602
September	8,613	45,629	16,024	61,653	8,613
October	15,327	39,404	14,368	53,772	15,327
November	7,428	42,242	15,624	57,866	7,428
December	5,940	48,301	19,537	67,838	5,940
Total	<u>241,086</u>	<u>501,747</u>	<u>143,463</u>	<u>645,210</u>	<u>241,086</u>
After Stockpile Transfers				-3,173	+3,173
Overrun				-	23,055
Total				<u>642,037</u>	<u>267,314</u>

MATHER MINE "B" SHAFT
ANNUAL REPORT
YEAR 1954

2. PRODUCTION
SHIPMENTS &
INVENTORIES: (Cont'd)

e. Production Delays:

An excellent operating year was had in 1954 as only three production shifts were lost. On February 22nd it was necessary to cease hoisting operations for one shift in order to change the west skip rope. A similar situation occurred on August 25th when it was necessary to change the east skip rope. A walkout on April 7th caused the loss of one production shift. The walkout was in protest of the new working schedule and this misunderstanding was quickly remedied.

MATHER MINE "B" SHAFT
ANNUAL REPORT
YEAR 1954

3. ANALYSIS:a. Average Mine Analysis on Output: (Incl. Stockpile)

<u>Grade</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Sulphur</u>
Mather Standard	58.56	.099	9.30	.043
Mather Special	57.16	.100	8.43	1.071

b. Average Analysis of Shipments: (Total Average)

<u>Grade</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Sulphur</u>	<u>Moist.</u>	<u>Iron Nat'l.</u>
Mather Standard	58.40	.091	9.86	.040	10.19	52.45
Mather Special	56.58	.092	8.60	1.040	9.77	51.05

c. Average Analysis of Ore in Stock:

<u>Grade</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>Sulph.</u>	<u>Loss</u>	<u>Moist.</u>
Mather Standard	206,780	58.67	.101	9.45	.31	2.48	.52	.54	.068	1.78	10.19
Mather Special	20,615	57.23	.093	4.18	.40	2.41	2.22	.58	1.497	3.82	9.77

MATHER MINE "B" SHAFT
ANNUAL REPORT
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4. COST OF OPENING, EQUIPPING,
DEVELOPING AND OPERATING:

a. Comparative Mining Costs:

	<u>1954</u>	<u>1953</u>
Product	909,351	1,080,150
Underground Costs	\$ 2.718	\$ 2.764
Surface Costs	.359	.371
General Mine Expense	.745	.681
Cost of Production	\$ 3.822	\$ 3.816
Less Transfer to Mather "A" Shaft		.007
Cost of Production	\$ 3.822	\$ 3.809
Allowance Under Section 309		\$.561
Amortization of Defense Facilities	\$.456	.359
Depreciation:		
Plant and Equipment	.171	.134
Development After 12/31/44	.104	.166
Pre-Production Development	.013	.014
Movable Equipment	.013	.011
Miscellaneous Equipment	.001	
Taxes	.232	.163
Administration	.050	.050
Loading and Shipping	.053	.049
Total Cost at Mine	\$ 4.915	\$ 5.316
Budget-Estimated Cost Per Ton	\$ 4.806	\$ 5.076
Number of Shifts and Hours	18 1-8 Hr. 121 2-8 Hr. 82 3-8 Hr.	4 1-8 Hr. 1 2-8 Hr. 246 3-8 Hr.
Total 8 Hr. Operating Shifts	506	744
Number of Operating Days	208-2/3	248
Average Daily Product	4,358	4,361

Proportion of Labor and Supplies

	<u>Amount</u>	<u>Per Ton</u>	<u>Per Cent</u>
Labor	\$2,255,815.97	\$2.480	56%
Supplies	1,753,768.39	1.929	44
Total Cost at Mine	\$4,009,584.36	\$4.409	100%

Comments:

To make the preceeding cost sheet coincide with the year end cost sheet, Administration costs have been included in 1953 and 1954 costs for the first time.

MATHER MINE "B" SHAFT
ANNUAL REPORT
YEAR 1954

4. COST OF OPENING, EQUIPPING,
DEVELOPING AND OPERATING: (Cont'd)

b. Detailed Cost Comparison (Operating):

	<u>1954</u>		<u>1953</u>	
	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>
Development	\$ 705,497.08	.776		
Mining	965,247.18	1.061		
Tramming	366,106.04	.402		
Ventilation	18,616.29	.020		
Pumping	21,713.17	.024		
Compressors & Air Lines	57,837.94	.064		
Underground Superintendence	151,498.82	.167		
Maint: Pockets and Chutes	3,161.28	.004		
Mining Equipment	122,122.43	.135		
Levels and Cross-cuts	48,153.41	.053		
Shaft	11,490.45	.012		
Total Underground Cost	\$2,471,444.09	2.718	\$2,985,243.19	2.764
Hoisting	\$ 136,151.54	.149		
Crushing and Screening - Surface	26,343.50	.029		
Stocking	47,880.45	.052		
Timber Yard	26,844.66	.030		
Dry House	30,289.32	.034		
Policing	20,431.64	.023		
General Surface	28,289.80	.031		
Maint: Headframe Bldg. & Equip.	1,850.76	.002		
Other Mine Buildings	8,221.27	.009		
Total Surface Cost	\$ 326,302.94	.359	\$ 400,230.81	.371
Geological Department	\$ 12,788.14	.014		
Mining Engineering Department	42,817.87	.047		
Mech. and Elect. Engineering Dept.	12,272.43	.013		
Safety Department	8,191.40	.009		
Research Laboratory	4,014.24	.005		
Analysis and Grading	75,666.77	.083		
Telephones & Safety Devices	57,136.02	.063		
Welfare - General & District	4,901.26	.004		
Special Expense - Pensions & Allow.	27,303.45	.030		
Ishpeming Office	84,196.53	.093		
Mine Office	69,250.68	.075		
Central Warehouse Overhead	22,403.70	.025		
Insurance	55,859.49	.062		
Personal Injury	21,184.66	.024		
Vacation Pay	69,757.60	.077		
Holiday Allowance	48,735.40	.054		
Taxes - Unemployment Insurance	22,191.06	.024		
Taxes - Old Age Benefit	39,277.18	.043		
Elect. Engineer - C. P. & L. Co.	41.25	-		
Total General Mine Expense	\$ 677,989.13	.745	\$ 736,108.09	.681
Less Transfer to Mather "A" Shaft			7,299.71	.007
COST OF PRODUCTION	\$3,475,736.16	3.822	\$4,114,282.38	3.809

MATHER MINE "B" SHAFT
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YEAR 1954

4. COST OF OPENING, EQUIPPING,
DEVELOPING AND OPERATING: (Cont'd)

Capital account expenditures for the year amounted to \$604,839.57 which brings the cumulative expenditures in E&A to \$12,415,965.64.

Capital Expenditures for Year	\$ 604,839.57
E&A NM-44 to Dec. 31, 1954	12,011,050.13
E&A NM-79 to Dec. 31, 1954	4,922.49
E&A NM-94 to Dec. 31, 1954	389,296.63
E&A NM-95 to Dec. 31, 1954	<u>10,696.39</u>
Total E&A to Dec. 31, 1954	\$12,415,965.64

The average cost per foot of main level drifting for the year was \$77.38. All drifting done during the year required ground support.

Total Charge Offs 1954	\$688,928.39
Total Capital Expenditures 1954	<u>604,839.59</u>
Net Decrease in Capital Account	\$ <u>84,088.80</u>

MATHER MINE "B" SHAFT
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5. ESTIMATE AND
ANALYSIS OF
ORE RESERVES:

The net ore reserves reported to the Tax Commission on December 31, 1954 were 19,235,428 tons. This shows an increase of 2,947,194 tons over the previous year. For this year's estimate it was possible to omit approximately one million tons which had previously been carried in Section 1 diamond drilling. This ore is located in the shaft pillar and under present plans it is not intended to mine in this area for many years. The 5th and 6th Level reserves remained approximately the same and the decrease shown can be attributed to production. The 7th Level reserves were decreased by a little over one million tons. Development work has indicated a decrease in the 7th Level reserves; however, the greater portion of the decrease was due to the year's production. Emphasis was placed on 8th, 9th, and 10th Level exploration during the year and a considerable increase in tonnage was realized. Two million additional tons were proven available for 8th Level mining by development and diamond drilling. Of major importance during the year was the additional two million tons proven below 8th Level by diamond drilling. The ore structures proven indicate substantial additional tonnages will be available to 9th and 10th Levels.

	<u>Mather Standard</u>	<u>Sulphurous</u>	<u>Total Tons</u>
Above 5th Level		2,722,517	2,722,517
Between 5th and 6th Levels		1,563,699	1,563,699
Between 6th and 7th Levels	5,639,850		5,639,850
Between 7th and 8th Levels	5,474,865		5,474,865
Between 8th and 9th Levels	2,537,500		2,537,500
Between 9th and 10th Levels	1,714,375		1,714,375
Below 10th Level	267,708		267,708
Sec. 1 Diamond Drill Hole Estimate	403,172		403,172
Total Gross as of July 31, 1954	16,037,470	4,286,216	20,323,686
Less Prod. July 31 to Dec. 31, 1954			347,625
Total Gross as of Dec. 31, 1954			19,976,061
Less 10% for Mining and Rock			2,032,369
Net Total as of Dec. 31, 1954			17,943,692
Net Total of Standard Ore Between 6th and 7th Levels estimated by "A" Shaft			1,291,736
Total Sec. 1 Ore as of Dec. 31, 1954			19,235,428

Expected Average Natural Analysis of Ore Reserves as of December 31, 1954:

<u>Grade</u>	<u>Total Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Lime Mag.</u>	<u>Sulph.</u>	<u>Loss</u>	<u>Moist.</u>
By Surface										
Diamond Drilling	362,855	54.40	.081	5.08	.10	2.62	.58	.60	.017	2.20 11.50
By Underground										
Development	17,859,274	51.50	.090	8.85	.45	2.62	2.50	.50	.300	2.00 10.50
	18,222,129									

MATHER MINE "B" SHAFT
ANNUAL REPORT
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6. LABOR AND WAGES:

a. Comments:

Previously, skilled miners were in short supply and it was necessary to do a considerable amount of shifting of men in order to keep the contracts operating at maximum efficiency underground. However, after the reduction in working force and schedule, during the first part of the year, there was sufficient skilled manpower available.

Labor relations were very good throughout the year. Only one grievance, which was carried over from 1953, was received during the year. This grievance, which involved Joseph and Donald Ombrello for failing to follow orders, was dropped in Step 4 by the Union.

b. Employment Record:

At the end of the year 480 men were employed at the mine. This represents a net decrease of 170 employees for the year.

Number of Men 1/1/54.....	658	
Losses - Laid Off.....	214	
Drafted	6	
Deceased.....	2	
Quit.....	16	
Transferred to other		
properties.....	<u>12</u>	
	250	-250
		<u>408</u>
Gains - Transferred from		
other properties.....	65	
Service returnees.....	<u>7</u>	
	72	+ 72
Total on Payroll 12/31/54.....	480	

c. Vacations and Holidays:

A two week vacation period from July 19th to July 31st was taken this year at the mine. There was no production during the vacation shutdown.

The men benefited by six paid holidays which were as follows: New Years, Memorial Day, Independence Day, Labor Day, Thanksgiving and Christmas. This was in accordance with the provisions of the labor contract.

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6. LABOR AND WAGES: (Cont'd)

d. Supervisory Personnel:

During the year five men were promoted, two were transferred to the Cliffs Shaft Mine and one man was transferred to Mather Mine "B" Shaft from Mather Mine "A" Shaft. Also, one man resigned to accept another position and a Foreman, Walter Touminen, was killed in an auto accident. Due to the reduction in working force and schedule it was necessary to demote five monthly men.

Promotions -

Mine Foreman A

Mine Foreman B

Harlan Robare
Suune Laitinen

Lawrence Delongchamp
Michael Bussone
Arne Luoma

Transfers -

From "A" Shaft to "B" Shaft - George Torreano, Ass't. Surface Foreman
From "B" Shaft to Cliff Shaft - Egidio Torreano, Mine Foreman A
From "B" Shaft to Cliff Shaft - Delbur Dahlstrom, Ass't. Surface Foreman

Resigned -

William Bianchi, Mine Foreman A

Deceased -

Walter Touminen, Mine Foreman B

Demotions -

From Class D Shift Boss to Sub-Supervisor - John Vercoe
Peter Peterson
John Renfors
Arthur Moore
Eino Maki

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6. LABOR AND WAGES: (Cont'd)e. Comparative Statement of Wages and Product:
(Operating Only - Not Including E&A Work)

	<u>1954</u>	<u>1953</u>	<u>Increase or Decrease</u>
<u>Average Wages Per Day:</u>			
Surface	\$ 17.83	\$ 16.96	\$.87
Underground	<u>20.66</u>	<u>19.49</u>	<u>1.17</u>
Total	\$ <u>20.06</u>	\$ <u>18.98</u>	\$ <u>1.08</u>
<u>Average Wages Contract Miner:</u>	\$ 22.63	\$ 20.82	\$ 1.81
 <u>Wages Per Month of 16 Days: (1953 Based on 20-2/3 Days)</u>			
Surface	\$285.28	\$350.56	\$65.28
Underground	<u>330.56</u>	<u>402.86</u>	<u>72.30</u>
Total	\$ <u>320.96</u>	\$ <u>392.32</u>	\$ <u>71.36</u>
 <u>Tons Per Man Per Day:</u>			
Surface	41.89	40.81	1.08
Underground	<u>11.27</u>	<u>10.33</u>	<u>.94</u>
Total	8.88	8.25	.63
 <u>Labor Cost Per Ton:</u>			
Surface	\$.426	\$.416	\$.010
Underground	<u>1.834</u>	<u>1.886</u>	<u>.052</u>
Total	\$ <u>2.260</u>	\$ <u>2.302</u>	<u>.042</u>

MATHER MINE "B" SHAFT
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7. SURFACE:

Buildings:-

The buildings remained in excellent condition and required only a minimum of upkeep.

New Installations and New Equipment:-

A fume collector was installed in the welding shop during the year. Also, in conjunction with the welding shop, a portable 300 amp. welding machine was purchased.

A car pull tugger was installed at the loading pocket to facilitate movement of the cars when loading.

In the North Jackson Pit area, a Byron-Jackson pump rated at 500 G.P.M. was installed in churn drill hole 150 to dewater the old underground workings of the Sand and North Shafts.

The installation of the heating units in the three stocking trestles was completed in the first part of the year.

Spill proof tail gates were installed on the Euclids to increase the loading capacity when wet material is being handled.

Engine House:-

The difficulties incurred in the engine house in 1953 with the drum failure were not repeated in 1954. It was necessary to change the east and west skip ropes during the year. Otherwise, only the normal upkeep was required to keep this portion of the plant operating efficiently.

Headframe and Stocking:-

There were no major delays in the headframe and stocking trestles during the year. The pocket on the north end of the North Conveyor was enclosed to prevent freezing and the rock pocket in the headframe was relined with wear plates. The major alteration, accomplished on weekends, was the changing of four skip sheave wheels and one cage sheave wheel.

Real Estate:-

There were a number of real estate purchases transacted during the year as part of the long range program for eventually clearing the area southeast of the shaft. Three houses and lots were purchased at a total cost of \$26,000.00.

Pumping:-

Pumping operations were started in November in the program for dewatering the old underground workings of the Sand and North Shafts in the North Jackson Pit area. This area is of importance to "B" Shaft in that it overlies a portion of the underground workings. A churn drill hole was put down and intersected the old stope at 155'. A Byron-Jackson deep well pump rated at 500 G.P.M. was installed. By the end of the year approximately 35,000,000 gallons had been pumped and indications were that a considerable volume remained to be pumped.

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8. UNDERGROUND:

a. General:

Ore production decreased from an average of 90,000 tons per month in 1953 to 75,800 tons per month in 1954. The decrease in production can be attributed to the reduction in working force and schedule at the mine.

Total production decreased from 1,080,150 tons in 1953 to 909,351 tons in 1954; actually only 170,799 tons less than the total produced in 1953 when the accelerated schedule was in effect.

Of the yearly tonnage, 267,314 tons or 29% came from 6th Level and 500,789 tons or 55% came from 7th Level. The remaining 141,248 tons or 16% was produced from 8th Level.

5th Level:-

The Mather Mine "A" Shaft 5th Level crew continued driving the main heading towards "B" Shaft. The drifting was temporarily stopped during the year due to an urgent need for this crew to extend a cross-cut on 8th Level. The drifting totaled 753' for the year which puts the heading 400' from the "B" Shaft 5th Level cutout. The connection will be made in 1955.

6th Level:-

Sub-level stoping and long hole stoping were employed in mining 221,000 tons of sulphurous ore from 6th Level. The extreme hardness of the ore made it necessary to install these methods of mining. Although development costs are comparatively higher in sub-level stoping, a clean product with little contamination from the hangingwall is obtained.

Area Between 6000 and 6100 Cross-cuts:-

Block #60-A: Sub-level stoping of this 400,000 ton sulphurous ore body continued during the year with production totaling 158,000 tons.

Area Between 6100 and 6200 Cross-cuts:-

Block #61-A: The 160,000 ton high sulphur ore body in this area, which was developed in 1953, produced 48,000 tons. Long hole stoping with grizzly subs was used in mining the above tonnage.

Area Between 6200 and 6300 Cross-cuts:-

Block #62-A: Sub-level stoping continued throughout the year in this area north of the No. 22 Dike. A total of 15,000 tons of sulphurous ore was mined from this stope.

Block #62-B:- Development was continued during the year in this sulphurous ore zone which is built up along the footwall. Sub-level stoping will be employed in mining this ore body.

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8. UNDERGROUND: (Cont'd)

a. General: (Cont'd)

Area Between 6200 and 6300 Cross-cuts:-

Block #63-B: Only the initial stages of development were carried out this year in this sulphurous ore zone. This block encompasses areas on both sides of the 6300 Cross-cut and will utilize a conveyor set-up. The ore, when mined, will pass through a projected underground crusher.

7th Level:-

The block caving system of mining is adaptable for use in all the Standard ore bodies on 7th Level. Depending on the size and hardness of the ore zones, either ring drilling from the slusher drift or long hole drilling from a sub above the slusher drift are used as the methods of undercutting.

The production from 7th Level for the year totaled 433,000 tons.

In order to maintain a balance in ore reserves between the two shafts, approximately 1,000,000 tons of Standard ore were allocated to "A" Shaft in 1953 from the 7600 Cross-cut to the boundary line.

Area Between 7000 and 7100 Cross-cuts:-

Block #70-A: Development and mining were advanced into the western portion of this block during the year. Production for the year showed 48,000 tons of Standard ore.

Block #70-B: Block caving was utilized in this 300,000 ton Standard ore body as production advanced from 11,000 tons in 1953 to 46,000 tons in 1954. The ore zone is found above the cross-cut as a result of a footwall roll.

Block #71-A: This is a 600,000 ton ore zone on the south side of the No. 22 Dike. Development progressed into the north portion of this block during the year with grizzly subs being installed as mining progressed up the dip. The Standard ore produced from this block during the year totaled 222,000 tons.

Area Between 7100 and 7200 Cross-cuts:-

Block #72-A: Ring drilling from one slusher drift was employed to mine the southern portion of this Standard ore body. Production from this stope totaled 15,000 tons.

Area Between 7200 and 7300 Cross-cuts:-

Block #73-A: The north portion of this 150,000 ton block which is on the south side of the No. 22 Dike, was developed during the year. By the end of the year 55,000 tons of Standard ore had been produced. Undercutting was done from the slusher drifts in this block.

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8. UNDERGROUND: (Cont'd)

a. General: (Cont'd)

Area Between 7200 and 7300 Cross-cuts:-

Block #73-D: Mining continued in this 100,000 ton Standard ore body with 29,000 tons being produced by the end of the year. Mining was carried into the western half of this block during the year so that the block actually encompasses areas on both sides of the 7300 Cross-cut.

Area Between the 7400 and 7500 Cross-cuts:-

Block #74-A: Development was completed in December in this 165,000 ton Standard ore body. Production by the end of the year totaled 7,000 tons. Three slusher drifts and one drilling sub are being employed in caving this ore zone found on the south side of the No. 22 Dike. Also developed in conjunction with this block was a small ore body on the east side of the cross-cut.

Block #75-A: Production for the year from this small stope on the north side of the No. 22 Dike showed 11,000 tons of Standard ore.

Area Between the 7500 and 7600 Cross-cuts:-

Block #76-A: Mining operations were completed in this block in January. At that time, 7,000 tons of Standard ore had been produced.

Block #76-B: Development and mining continued during the year in this Standard ore zone which is built-up along the footwall north of the No. 22 Dike. By the end of the year, this block cave area had produced 32,000 tons of Standard ore.

Area From 7600 Cross-cut to Boundary Line:-

This area is being developed and mined by Mather Mine "A" Shaft.

8th Level:-

Emphasis was placed on 8th Level development during the year with actual production being realized from one block cave area. At the end of the year three more blocks were under development. The development work and diamond drilling have indicated the ore zones to be of Standard grade and readily adaptable to the block caving system of mining. The stope on 8th Level produced 112,000 tons.

Area Shaft Plat and Underground Crusher Plant:-

The east skip plat was completed during the year. Work progressed on the crusher plant installation with the conveyor drift being completed and work started on the excavation for the crusher box. Also, the excavation was completed on the discharge end of the conveyor and the tops of the discharge and counterweight raises were concreted. The conveyor trench was also completed. The ore pass raise from the sub above the conveyor drift to 7th Level was started and by the end of the year was 93' above the level.

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8. UNDERGROUND: (Cont'd)

a. General: (Cont'd)

Area Main Line:-

The Mather Mine "B" Shaft and "A" Shaft main headings were connected on December 22nd. The point of connection was approximately 2,400' west of the boundary line. During the advance, diamond drill stations were cut at 250' intervals and one cross-cut (8920) was turned for switching.

Area East of 8400 Cross-cut:-

Block #84-A: Development was continued in this 1,500,000 ton ore body which is 120' above the level. Because of the texture and height of the ore, the block caving system utilizing grizzly subs, slusher drifts and drilling subs will be adapted to mining in this area.

Area Between 8400 and 8500 Cross-cuts:-

The ore zone in the 8400 Cross-cut area has plunged to within 50' of the level on the 8500 Cross-cut side. Approximately 1,000,000 tons are enclosed in this area between the two cross-cuts. Development above the cross-cut continued during the year but with emphasis in the area west of the cross-cut. A ventilation connection was driven between the 8500 and 8400 Cross-cuts during the year.

Area Between 8500 and 8600 Cross-cuts:-

Block #86-A: On the 8600 side the above mentioned Standard ore zone has plunged to level elevation. This represents the first area mined on 8th Level and produced 112,000 tons during the year. Five slusher drifts and one drilling sub were used in this block cave area. Development progressed in the other half of this block on the 8500 side to a point where undercutting was starting at the end of the year.

Area Between 8600 and 8700 Cross-cuts:-

A ventilation connection was driven between the two cross-cuts during the year. Diamond drilling has indicated a high grade Standard ore body to extend through the area at level elevation.

Area Between 8700 and 8800 Cross-cuts:-

Block #88-A: The 8700 Cross-cut was driven an additional 285' during the year to permit development of the ore body west of the cross-cut. The development is somewhat complicated in this area in that the Cambria-Jackson Fault cuts across terminating the ore body. The block being developed is on the south side of the No. 22 Dike which is also cut by the fault. By using these two structural features as boundaries and isolating the other two sides of the block, approximately 75% of the ore will be isolated. By the end of the year development had progressed to the undercut level.

A ventilation connection was completed between the two cross-cuts.

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8. UNDERGROUND: (Cont'd)

a. General: (Cont'd)

Area 8800 Cross-cut:-

The cross-cut was extended an additional 100' by the end of the year as drifting was resumed in December. The drift will be extended another 215' south for future mining and exploration. A ventilation connection was driven to the 8900 Cross-cut during the year.

Area 8910 Cross-cut:-

The Mather Mine "A" Shaft miners moved into the cross-cut and extended it 270' by the end of the year. Mather Mine "A" Shaft will mine the ore west of the cross-cut. At the end of the year the pick-a-back drift had been completed and preparations were being made to drive the slusher drifts to the west. The cross-cut will be extended farther for future exploration.

9th Level:-

On 9th Level the work continued in the area of the shaft with the cage plat being completed. Concreting of the floor and installation of the tracks was also completed in 1954.

10th Level:-

The main heading was advanced to a point 1,525' southwest of the shaft. The drift was expanded from 9' x 11' to 9' x 15' in the last quarter of the year to facilitate the conveyor that will extend through this portion of the drift. Roof bolting has been utilized in this portion of the drift and has proven successful to date.

In the 10th Level pump station, the installation of the 500 G.P.M. Worthington pump was completed. Work is now underway for the future installation of a 500 G.P.M. centrifugal pump in the No. 3 Stall.

The 260' rock pass raise between the 10th Level trench and 9th Level was completed during the year. This will permit passage of the 9th Level development rock to 10th Level thus eliminating the need of developing a storage trench and skip pocket on 9th Level.

GILBERT BOND

MATHER MINE "B" SHAFT
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8. UNDERGROUND: (Cont'd)

b. Exploration:

The diamond drill program carried out at Mather Mine "B" Shaft in 1954 was reduced by 3,000 feet in comparison to last year's drilling program. The major portion of the drilling was carried out from 8th Level with the remainder being distributed among 6th and 7th Levels. Actually only a minor amount of drilling was carried out from the latter two levels as the emphasis was placed on 8th Level exploration. The program was planned to cover the following objectives:

1. Detailing 5th and 7th Level ore.
2. Outlining and detailing 8th Level ore.
3. Outlining 9th Level ore.
4. Outlining 10th Level ore.

The 1955 drilling program will emphasize continued detailing of the 8th Level ore zones and further outlining of the 9th and 10th Level ore zones. Only minor amounts of drilling are anticipated for the upper levels.

6th Level:

Only one hole was drilled from 6th Level during the year and this was for 5th Level contacts.

7th Level:

A total of five holes were drilled from 7th Level during the year. This drilling was concentrated more on detailing ore outlines prior to the mining operation rather than on testing ore structures. All of the drilling from 7th Level was for testing 7th Level outlines.

8th Level:

The main diamond drill activity was centered on 8th Level during the year with a total of twenty-two holes being drilled. The drilling on 8th Level included testing prior to block development and drilling from several of the cross-cuts. Of major importance on 8th Level was the drilling carried out to test the 9th and 10th Level ore zones. Six holes were drilled totaling 2,558 feet and showing 1,966 feet of first class ore. This drilling also provided the 9th and 10th Level footwall contacts at enough points to permit accurate planning of the two levels. A considerable increase in tonnage was realized as a result of this drilling.

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8. UNDERGROUND: (Cont'd)b. Exploration: (Cont'd)

The following table shows the drilling for the year.

<u>Holes Drilled From 6th Level To Explore 5th Level</u>	<u>Drilled From</u>	<u>Footage Drilled</u>	<u>1st Class Ore Drilled</u>	<u>Total Depth</u>
Hole Number: 226	125'	215'	170'	340'
<u>Holes Drilled From 7th Level To Explore 7th Level</u>				
231	0'	142'	45'	142'
264	0'	140'	40'	140'
266	0'	102'	50'	102'
271	0'	212'	73'	212'
275	0'	263'	153'	263'
<u>Holes Drilled From 8th Level To Explore 8th Level</u>				
224	374'	154'	63'	528'
235	0'	351'	93'	351'
239	0'	230'	135'	230'
244*	0'	186'	0'	186'
247	0'	270'	197'	270'
252	0'	235'	165'	235'
253	0'	236'	104'	236'
255*	0'	712'	329'	712'
258	0'	217'	150'	217'
260	0'	157'	88'	157'
261	0'	268'	26'	268'
262*	0'	290'	138'	290'
265	0'	166'	107'	166'
268	0'	351'	206'	351'
269*	0'	785'	242'	785'
279*	0'	84'	31'	84'
<u>Holes Drilled From 8th Level To Explore 9th Level</u>				
230	0'	295'	245'	295'
245	0'	340'	210'	340'
251	0'	315'	165'	315'
<u>Holes Drilled From 8th Level To Explore 10th Level</u>				
238	0'	535'	525'	535'
234	0'	440'	315'	440'
259	0'	628'	479'	628'
Totals	28	8,319'	4,544'	
Drilling Done in				
Sec. 2 For Mather				
"A" Shaft	-5	-2,057'		
	23	6,262'		(Total Sec. 1 Drilling)

*Holes Drilled For "A" Shaft

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8. UNDERGROUND: (Cont'd)c. Timbering:

Statement of Ground Support Material Used Under Develop-
ment and Mining Accounts

<u>Item</u>	<u>Amount</u>	<u>Cost Per Ton</u>
Cribbing	\$13,637.18	.01499
Stull Timber	5,284.78	.00581
Lagging	17,140.13	.01884
Poles	11,318.84	.01244
Steel	<u>191,635.62</u>	<u>.21073</u>
Total 1954	\$239,016.55	.26281
Total 1953	\$211,907.78	.19618
Total 1952	\$115,926.64	.16895
Total 1951	\$ 64,141.28	.13411
Total 1950	\$ 17,562.05	.36497

d. Explosives:

Explosives Used in Breaking 909,351 Tons of Ore In
Development and Mining Accounts

<u>Item</u>	<u>Amount</u>	<u>Cost Per Ton</u>
Gelamite (1 $\frac{1}{2}$ x8)	\$ 30,250.07	.03326
Gelamite (1-1/8x8)	855.05	.00094
Gelamite (1 $\frac{3}{4}$ x8)	822.51	.00090
Hercomite (1 $\frac{3}{4}$ x24)	40,346.03	.04437
Gelatin	<u>37,045.99</u>	<u>.04074</u>
Total Powder	\$109,319.65	.12021
Blasting Supplies	<u>58,478.67</u>	<u>.06431</u>
Grand Total Powder & Blasting Supplies	\$167,798.32	.18452

Pounds of Powder Per Ton of Ore	.637428
Tons of Ore Per Pound of Powder	1.568804
Cost Per Ton For Powder	.120217
Cost Per Ton For Fuse, Caps, etc.	.064308
Cost Per Ton For All Explosives	.184525

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8. UNDERGROUND: (Cont'd)

e. Pumping:

All the shaft water is collected and stored behind the 4th Level dam and used as drilling water. It has to be supplemented with City water to meet the underground requirements. All the mine water at "B" Shaft flows to "A" Shaft along the 6th Level footwall drift. During the year the average flow from 6th Level was 70 G.P.M., 7th Level 41 G.P.M. and 8th Level 45 G.P.M. The water from 7th and 8th Levels flows toward the shaft where it is pumped to 6th Level.

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9. TAXES:

Mather Mine "B" Shaft, including stockpile, supplies and equipment as placed by State Tax Commission:

	1954			1953		
	<u>Valuation</u>	<u>Rate</u>	<u>Taxes</u>	<u>Valuation</u>	<u>Rate</u>	<u>Taxes</u>
Section 1, 47-27						
Real	\$3,000,000		\$133,440.00	\$2,445,000		\$113,325.75
Personal	<u>1,710,000</u>		<u>76,060.80</u>	<u>1,325,000</u>		<u>61,413.75</u>
Total	\$4,710,000	44.4800	\$209,500.80	\$3,770,000	46.3500	\$174,739.50
Coll. Fee		<u>.4448</u>	<u>2,095.01</u>		<u>.4635</u>	<u>1,747.40</u>
Total Mather Mine "B" Shaft (Sec. 1 City of Negaunee)	\$4,710,000	44.9248	\$211,595.81	\$3,770,000	46.8135	\$176,486.90

	1954		
	<u>Taxes</u>	<u>Per Ton Produced</u>	<u>Per Ton Shipped</u>
Operating	\$211,595.81	\$0.232	\$0.246
Idle Expense	-	-	-
Total	\$211,595.81	\$0.232	\$0.246

	1953		
	<u>Taxes</u>	<u>Per Ton Produced</u>	<u>Per Ton Shipped</u>
Operating	\$176,486.90	\$0.163	\$0.167
Idle Expense	-	-	-
Total	\$176,486.90	\$0.163	\$0.167

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10. ACCIDENTS AND PERSONAL INJURY:

There were thirty-one compensable injuries during the year. The thirty-one compensable injuries occasioned lost time of 952 days. There were also twelve non-compensable injuries which added 35 days lost time, for a grand total of 987 days. This resulted in a severity rate of 1.072 days lost per thousand man hours and a frequency rate of 46.72 injuries per million man hours, compared with Company averages for underground mines of 1.243 and 29.63. The total hours worked were 920,472, as compared with 1,207,945 for 1953.

<u>Date</u>	<u>Name</u>	<u>Nature of Injury</u>	<u>Days Lost</u>
1- 4-54	Robert Leaf	Fractured bone in left foot.	50
1-11-54	Henry Riberdy	Laceration at base of big and second toe.	20
1-13-54	Massimo Spelgatti	Contusion of chest over sternum level of third costal cartilage.	30
1-15-54	William Etapa	Bruised and swollen right thigh.	41
2- 4-54	Peter Belpedio	Fracture of proximal phalanx right great toe.	46
2- 9-54	Ray Barney	Bruised back, laceration right hand.	11
2-11-54	Harry Carlson	Cut on upper eye lid (left eye).	12
2-15-54	Joseph Couveau	Incomplete fracture left internal malleolus.	34
2-25-54	Leslie Conradson	Cracked bone in right elbow.	33
3- 4-54	William Juidici	Back of right hand bruised and a bone broke.	32
3-16-54	Clifton Senical	Sore neck.	43
3-19-54	Peter Ombrello	Lacerated chin and lower lip.	10
3-24-54	Frank Guizetti	Sore left leg.	23
3-29-54	Donald Ombrello	Laceration over back of left hand.	9
3-30-54	Edward Turcotte	Cut and bruised right shoulder, right side of back and left foot.	38
3-30-54	Clarence Verran	Broken bone in right foot.	44
4- 8-54	Reino Lepisto	Bruised third finger left hand.	7
5-27-54	James Baldini	Little finger of left hand amputated below first joint.	150
6-17-54	Arne Lintula	Bruised big and index toe on left foot.	33
6-21-54	George Prusi	Sore and painful back.	9
6-23-54	Sulo Pohjala	Sore and swollen thumb, also bone broke between first and second joint, left hand.	50
7-12-54	Paul Hutander	Contusion of instep left foot.	11
7-13-54	Frank Balbierz	Bruised right side.	12
8- 3-54	George Prusi	Lump on the back of his head.	8
8-10-54	Walfred Salo	Lacerated and bruised index and middle finger, left hand.	8
10- 5-54	Steve Schuster	Chipped bone in left shoulder.	60
10-14-54	Paul Helgren	Broken thumb right hand.	37
10-19-54	Nels Anderson	Swelling of left forearm, cuts about the feet and head and sore chest.	19
11-10-54	John Kosonen	Broken bone left foot.	30
12-23-54	Francis Guizetti	Fractured a bone in right hand.	30
12-23-54	James Perkins	Bruised left side.	12
			952

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11. POWER:

	<u>CONSUMPTION</u> <u>K.W. HOURS</u>	<u>AVERAGE</u> <u>MAX. DEMAND</u>	<u>AVERAGE</u> <u>DEM. FACTOR</u>	<u>COST OF</u> <u>CURRENT</u>	<u>AVERAGE PRICE</u> <u>PER K.W. HOUR</u>
1954 -	12,486,451	3,020 K.W.	47.6%	\$116,430.27	\$0.00932
1953 -	13,519,000	2,780 K.W.	55.5%	\$217,415.82	\$0.01608
1952 -	10,626,000	1,161 K.W.	66.7%	\$170,935.03	\$0.01608
1951 -	8,680,000	1,876 K.W.	52.8%	\$138,129.28	\$0.01591

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1. GENERAL

The 1954 production was 146,740 tons. This is a decided decrease as compared to the 212,344 tons produced in 1953. There were two main reasons for this decrease in tonnage. First, beginning April 4, 1954, the Mine reduced the operating schedule from five days per week to four days. Secondly, the orebody was nearly depleted towards the latter part of the year with only one producing stope in operation. Shipments for 1954 were 101,368 tons, as compared to 177,406 tons in 1953.

The operating schedule at the Spies Mine was five days per week January 1 to April 4, 1954, at which time the Mine reduced to a four-day per week production schedule for the balance of the year.

A diamond drill program was conducted on surface and underground throughout the year. A total of thirteen underground holes were drilled, six from 4th level, four from 6th level and three from 8th level. Eleven surface holes were drilled, two on the Spies property, three on the Allen forty and six on the McDermott.

Underground holes no. 76, 78 and 80 were part of a program which drilled a lens of sulphurous ore west of the Spies East 6th level workings. The completed search indicated insufficient tonnage to warrant development.

Underground holes no. 75, 85 and 86 completed our survey of possible tonnage for mining below 8th level. An estimate in the vicinity of 1,500,000 tons of recoverable ore has been calculated for this area extending to a depth of 800 feet below 8th level.

Underground holes no. 77, 79, 81, 82, 83 and 84 were a series of short holes designed to test any possible extensions of the old Spies 4th level Deposit. These holes outlined the iron-formation containing some ore above 4th level and showed no enrichment below the 4th level.

Underground hole no. 87, now in progress, is drilling from the 6th level Virgil drift and is directed south toward the Allen property. This hole will test at depth the iron-formation located on the Allen forty. Because of the known structure, testing in this area is less costly by underground rather than surface drilling.

Diamond drill holes no. 89, 90 and 91 were drilled on the Allen forty in order to determine whether ore was located here which could be mined from the Spies shaft from 8th level or above. Rich iron-formation was encountered in each hole and further testing of this property is being continued by underground hole no. 87.

Diamond drill holes no. 87 and 88 were the last holes in the program to locate the Spies East limb of iron-formation between the Spies working and enrichment in diamond drill hole no. 79 to the South. These holes cut only a small amount of unoxidized iron-formation which does not appear to be the connecting limb in question. These holes are in Section 24, the same Section on which the Mine is located.

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1. GENERAL (Continued)

Diamond drill holes no. 1, 1-A, 2, 3, 4 and 5 tested the McDermott forties in Section 25, 43-35. All holes, with the exception of no. 5, cut oxidized iron-formation. These holes found the oxidized iron-formation rolling to the south in large folds with no orebodies therein.

The future drilling program at the Spies Mine is questionable, and entirely dependent on the findings of underground hole no. 87, which is being drilled at the present time. If underground hole no. 87 doesn't reveal any encouraging information, the drilling program will be completed, and it is expected that the operation of the Spies Mine will also be terminated.

Production from the Spies Mine was realized from the 8th and 4th levels. The 8th level Spies East Deposit produced 140,159 tons of the annual tonnage with the balance, or 6,581 tons, coming from the 4th level Old Spies orebody.

There were three active stopes in the Spies East Deposit above 8th level during 1954. No. 1 sublevel stope operated until August when it became necessary to abandon operations because the sulphur fumes emitting from this area were causing residents in the Ice Lake location so much discomfort. They complained about the obnoxious smell and the sulphur fumes were affecting the lead base paint on their homes. The small pillar of ore remaining in this area will be scrambled out during the winter months of 1955 when the fire should be out.

The no. 6 stope continued regular sublevel stoping operations until December, 1954, when the 6th level floor pillar caved in and all the caved material from the Old 6th level stope filled up this mining area. An attempt will be made to recover the remaining pillar of ore in this stope.

Drilling and blasting of the long holes in the no. 5 shrinkage stope was completed the first week in February and tramming crews continued to pull broken ore from this area for the balance of 1954. There remains an estimated 6,000 tons of broken ore to be recovered from this stope in 1955.

Development of a stoping area was begun in the Old Spies orebody in June. This is a high phosphorous-high sulphur ore, which is not too good grade-wise, but something was needed to help supplement the depleting Spies East orebody above 8th level. Actual mining was begun in the latter part of August and it was found that the only good product to be realized would come from near the 3rd level elevation. Therefore, the estimated 200,000 tons of ore in this area was drastically reduced to about twenty-five per cent of the original estimate.

A raise in rock, near the Spies East Deposit, was driven between the 4th and 6th levels to help isolate no. 1 stope which was burning and is mentioned above and to also provide a second outlet to replace the crushed raises in the orebody.

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1. GENERAL (Continued)

Another raise in rock was driven near the old Spies Deposit to provide proper ventilation in this area.

These two raises and a small pumphouse on 4th level at shaft comprised the only rock development at the Spies Mine in 1954.

New equipment that was purchased for the operation of the Spies Mine consisted of a new stainless-steel shaft pump that was needed to keep the skip-pit free of water and a new fabricated drum shell for the skip hoist. The new drum was installed during the week of November 15th to the 22nd. The reason this drum was purchased was because the old drum had worn from its original 1-3/4" shell thickness down to approximately one-half that size and considerable cracks were found in the ribs inside the drum itself, establishing this piece of equipment a definite safety hazard. According to safety standards, the thickness of the drum shell should not be less than the diameter of the rope used for hoisting, which in this case is a 1-1/4" rope.

The Spies Mine tractor, which is a 1944 International TD-14, was sent to Ishpeming for general repairs and because of the rough shape of the entire undercarriage and the motor, it was agreed that the Spies Mine should rent a unit from one of the idle open-pit properties until the Spring of 1955. The first unit sent down to the Spies Mine was the Mather Mine "A" Shaft 1940 Caterpillar D-8. This tractor turned out to be in as bad operating shape as the old Spies Mine unit. At the end of the year, arrangements were being made to transfer another D-8 to the Spies Mine from the Ohio open-pit operation.

Wage adjustments during 1954 amounted to an overall five-cents per hour add-on to hourly wages as well as incentive wages as of July 1, 1954.

2. PRODUCTION

a. Production by Grades and Months

<u>Month</u>	<u>Days</u>	<u>Spies Grade Tons</u>	<u>Hi-Sul Grade Tons</u>	<u>Total Ore Tons</u>	<u>Total Rock Tons</u>	<u>Tons Per Man Per Day</u>
January	20	12,931		12,931	48	6.00
February	20	15,239		15,239		7.55
March	23	18,023		18,023	752	7.96
April	18	12,828		12,828	824	6.93
May	16	13,922		13,922	292	8.58
June	18	12,723		12,723	188	6.98
July	8	6,015		6,015	356	4.69
August	18	11,871		11,871	332	6.51
September	17	11,255		11,255	160	6.37
October	16	10,580		10,580	388	6.09
November	13	7,191	539	7,730	660	4.80
December	21	8,041	5,582	13,623	428	6.85
Total	208	140,619	6,121	146,740	4,428	6.69

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2. PRODUCTION (Continued)

b. Shipments

The following table shows the shipments for the past five years:

<u>Year</u>	<u>Pocket</u>	<u>Stockpile</u>	<u>Total</u>
1954	24,170	77,198	101,368
1953	80,786	96,620	177,406
1952	59,642	67,085	126,727
1951	156,988	93,135	250,123
1950	120,240	137,598	257,838

There was a decrease in shipments from the Spies Mine during the year of 1954, as compared with 1953. The reason for the decrease was the decline in ore sales.

A breakdown of shipments is as follows - 24,170 tons were shipped from the pocket and 77,198 tons were shipped from the stockpile. No Spies Mine ore was loaded at the LS&I dock at Marquette in 1954. At the Escanaba dock, no ore was shipped as Straight Cargo, the entire tonnage of ore being shipped as Cliffs Group.

c. Ore Statement

	<u>Spies Grade</u>	<u>Hi-Sul Grade</u>	<u>Total</u>	<u>Total Last Year</u>
On hand January 1, 1954	98,211	- -	98,211	63,273
Output for year	140,619	6,121	146,740	193,283
Overrun	- -	- -	- -	19,061
Total	238,830	6,121	244,951	275,617
Shipments	101,368	- -	101,368	177,406
Balance on Hand	137,462	6,121	143,583	98,211
Decrease in output			46,543	
Decrease in shipments			76,038	
Increase in ore on hand			45,372	

The operating schedule for the past five years is as follows:

- 1954 - Hoisting and mining operations - two eight hour shifts per day, five days per week January 1st to April 4th. Effective April 5th, two eight hour shifts per day, four days per week.
- 1953 - Hoisting and mining operations - two eight hour shifts per day, five days per week.
- 1952 - Hoisting and mining operations - two eight hour shifts per day, five and one-half days per week January 1st to November 15th. Effective November 16th, two eight hour shifts per day, five days per week.

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2. PRODUCTION (Continued)

The operating schedule for the past five years is continued as follows:

1951 - Hoisting and mining operations - two eight hour shifts per day, six days per week January 1st to February 1st. Effective February 2nd, two eight hour shifts per day, five and one-half days per week.

1950 - Hoisting and mining operations - two eight hour shifts per day, four days per week January 1st to May 15th. Schedule increased to five days per week effective May 15th and later to six days per week effective August 21st.

d. Division of Product by levels and Months

<u>Month</u>	<u>8th Level</u>	<u>4th Level</u>	<u>Total</u>
January	12,931		12,931
February	15,239		15,239
March	18,023		18,023
April	12,828		12,828
May	13,922		13,922
June	12,626	97	12,723
July	5,780	235	6,015
August	10,921	950	11,871
September	10,222	1,033	11,255
October	9,180	1,400	10,580
November	7,006	724	7,730
December	<u>11,481</u>	<u>2,142</u>	<u>13,623</u>
Total	140,159	6,581	146,740

e. Production Delays

The only major delay was due to the installation of the new skip hoist drum. In November, it was necessary to replace the skip hoist drum shell with a new fabricated drum from Nordberg. The mine was closed down during the week of November 15th to the 22nd. This resulted in a loss of four days in production in November, however, three of the days lost were made up in December by working on Fridays. This resulted in only one day's loss of production, or 600 tons of ore.

3. ANALYSIS

a. Average Mine Analysis on Output

<u>SPIES</u>				
<u>Tons</u>	<u>Fe</u>	<u>Phos</u>	<u>Sil</u>	<u>Sul</u>
140,619	57.39	.259	7.35	.119

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3. ANALYSIS (Continued)a. Average Mine Analysis on Output (Continued)

<u>HI-SULPHUR</u>				
<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Sil</u>	<u>Sul</u>
6,121	52.59	.350	13.45	.178

b. Average Analysis of Shipments

<u>Grade</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Sil</u>	<u>Mang</u>	<u>Alum</u>	<u>Lime</u>	<u>Mag</u>	<u>Sul</u>	<u>Loss</u>	<u>Moist</u>
Spies	101,368	56.80	.267	8.10	.18	1.58	.15	.30	.079	7.40	8.20

c. Average Analysis of Ore in Stock

<u>Grade</u>	<u>Iron</u>	<u>Phos</u>	<u>Sil</u>	<u>Mang</u>	<u>Alum</u>	<u>Lime</u>	<u>Mag</u>	<u>Sul</u>	<u>Loss</u>	<u>Moist</u>
Spies Dried	57.17	.259	8.01	.18	1.58	.15	.30	.105	7.40	8.20
Hi-Sul "	52.59	.249	13.45	.18	1.58	.15	.30	.179	7.90	8.20

4. ESTIMATE AND ANALYSIS OF ORE RESERVESa. Estimated Reserves

The following is an estimate of reserves submitted to the Michigan State Tax Commission as of December 31, 1954, using a factor of 12 cubic feet per ton.

	<u>East Deposit</u>	<u>Spies Deposit</u>	<u>Total</u>
Between 3rd and 4th Levels	-	166,112	166,112
Between 6th and 8th Levels	61,564	-	61,564
Total Gross as of July 31, 1954	61,564	166,112	227,676
Less 10% for Mining and Rock	6,156	16,611	22,767
Net Total as of July 31, 1954	55,408	149,501	204,909
Less Production, July 31-Dec. 31, 1954	55,059	-	55,059
Net Total as of December 31, 1954	349	149,501	149,850

The indicated ore reserves show an increase of 29,900 tons over the 1953 estimate. The additional tonnage comes from the old Spies Deposit and the recovery of some of the supporting pillars above 8th level.

This estimate, as previously stated, was sent to the State Tax Commission as of December 31, 1954, however, since that time a cave occurred in the only producing stope above the 8th level in the Spies East Deposit cutting the estimated tonnage of ore down to an approximate 30,000 tons of recoverable straight Spies ore. This, along with the fact that the analysis of the ore being realized from the old Spies isn't what was expected, leaves the Spies Mine with an estimate of 50,000 tons of mineable ore for 1955.

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4. ESTIMATE AND ANALYSIS OF ORE RESERVES (Continued)

a. Estimated Reserves (Continued)

The overall picture, as far as the Spies East Deposit ore is concerned, shows that there has been an additional tonnage of ore developed during the current year over the estimate of 1953, and this increase in estimated reserves is due to the mining of portions of the supporting pillars that had previously been left intact. The reason for mining these pillars is the fact that upon inspection of these pillars above 4th level, it was found that all pillars in question had crushed or caved, therefore, not affording any support to back of the 4th level stopes.

b. Expected Analysis of Ore Reserves as Submitted to the Michigan State Tax Commission

<u>Grade</u>	<u>Iron</u>	<u>Phos</u>	<u>Sil</u>	<u>Mang</u>	<u>Alum</u>	<u>Lime</u>	<u>Mag</u>	<u>Sul</u>	<u>Loss</u>	<u>Moist</u>
Spies Dried	56.50	.256	9.00	.23	2.67	.24	.21	.100	7.78	
Spies Nat'l	50.85	.230	8.10	.21	2.40	.22	.19	.090	7.00	10.00

Average Expected Analysis of Hi-Sulphur

<u>Iron</u>	<u>Phos</u>	<u>Sil</u>	<u>Sul</u>
55.50	.460	6.00	.275

5. LABOR AND WAGES

a. Labor Relations

The Spies Mine had 100 per cent union membership which is the same as in the past. The relationship between the Company and the Union has been good. One grievance was filed during the year which progressed to a stage four meeting, at which time the Union dropped the grievance. The grievance is as follows:

Walter Kmiecik grieved that his seniority rank entitled him to take a scraper-man's job on another shift which was open on occasion because of absenteeism. The Company claimed that the work was only temporary and, therefore, did not call for posting. The Spies Mine Grievance Committee indicated that they were not interested in processing the grievance since they were in accord with the Company's stand. However, Kmiecik overstepped the local Committee and filed his grievance with Mr. Diadace Dion, District Union Representative, who in turn carried the grievance to step four where the Union finally dropped the matter.

An interesting sidelight was that Kmiecik claimed discrimination against him since he was a Displaced Person, but when the grievance committee was asked if the Company had discriminated against Kmiecik, without exception the answer was negative. It was unanimously stated by the Grievance Committee members that they had never seen anyone get pushed around by the Spies Mine bosses.

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5. LABOR AND WAGES (Continued)

b. Employment

The following is a table of employment statistics:

Number of men on payroll beginning of year	100
Number of men added during the year	0
Number of separations during the year	<u>2</u>
Number of men on payroll end of year	98

Average number of men as per December labor statement 102½

The percentage of absenteeism in 1954 was 4.9 per-cent.

There were 98 employees on the payroll at the end of 1954, compared with 100 employees a year ago. There were no hires and two separations, of which both were quits, resulting in a decrease of two men.

c. Statement of Wages

<u>Average Wages per Day</u>	<u>1954</u>	<u>1953</u>	
Surface	<u>18.53</u>	<u>17.85</u>	
Underground	<u>20.57</u>	<u>20.56</u>	
Total	<u>19.82</u>	<u>19.66</u>	
<u>Average Wages per Month</u>			<u>Decrease</u>
Surface	321.12	369.50	<u>48.38</u>
Underground	<u>356.48</u>	<u>425.59</u>	<u>69.11</u>
Total	<u>343.48</u>	<u>406.96</u>	<u>63.48</u>
<u>Tons per Man per Day</u>			
Surface	18.24	23.37	
Underground	<u>10.56</u>	<u>11.69</u>	
Total	<u>6.69</u>	<u>7.79</u>	
<u>Labor Cost per Ton</u>			
Surface	1.016	.764	
Underground	<u>1.948</u>	<u>1.760</u>	
Total	<u>2.964</u>	<u>2.524</u>	

6. SURFACE

The East stocking trestle was replaced for stocking high-sulphur ore. The old garage for housing the tractor at the Spies Mine was torn down and was being rebuilt bigger in order to accommodate the larger D-8 Caterpillar unit that was being transferred to the Spies Mine. The construction was in progress at the end of the year. A new coal dock was constructed by the surface crew on the recommendation of the Railroad Company.

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7. UNDERGROUND

a. General

The rock development work at the Spies Mine during 1954 was limited to two ventilation raises, one between the 6th and 4th levels near the Spies East Deposit and the other between the 4th and 3rd levels in the old Spies area, and a small pumphouse cutout on 4th level near shaft.

The raise in rock near the Spies East Deposit was driven from the 6th level to the 4th level to isolate the no. 1 stope area which was burning and exhausting sulphur fumes into the Ice Lake residential area. It also provides a second outlet for the mine to replace the crushed raises in the orebody. The other raise in rock was driven between the 4th and 3rd levels near the old Spies Deposit to provide proper ventilation of this stoping area. This raise was so located to permit direct ventilation using the air shaft ventilation setup without the need of auxiliary fan equipment.

The small pumphouse was excavated on 4th level at shaft to permit the utilization of trench facilities for the ore being mined in the old Spies orebody.

On 8th level, regular stoping operations were carried on in the no. 1 stope until August 6, when this area was sealed off because of the sulphur fumes emitting from this area. Approximately 10,000 tons of ore remained to be mined but recovery of this ore will be realized early in 1955 when the fire should be out. If a fire does rekindle, the cold and windy weather should completely dissipate the fumes that are exhausted at the air shaft without any ill effects or complaints from residents of the Ice Lake district.

There was no mining in the no. 2 stope area, however, an attempt will be made to recover a portion of the supporting pillar between the no. 2 and no. 3 stopes at the same time that recovery of the remaining tonnage in no. 1 stope is being realized.

Long hole drilling and blasting was completed in no. 5 shrinkage stope area by the first part of February, 1954. Trimming crews continued to pull the broken ore from this stope throughout the year. As of December 31, 1954, there remained an approximate 6,000 tons of broken ore to be recovered from this area. A small pillar of ore on the southeast side of no. 5 shrinkage stope was developed for a small scam stope operation to help bolster production from the Spies Mine.

Due to the disappointing ore outline found in no. 6 stope by development, permission was granted by the Ishpeming office to mine the supporting pillar between no. 5 and no. 6 stopes to provide a reasonable mining tonnage in this South end of the Spies orebody. No. 6 stope was the only active producing stope at the Spies Mine during the entire year. On December 28, this stope caved through from the 6th level necessitating the re-development of the remaining pillar of ore.

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7. UNDERGROUND (Continued)

a. General (Continued)

These four pillars mentioned constituted the total reserves of standard Spies ore remaining to be mined in the Spies East Deposit. This total tonnage will not exceed 30,000 tons of ore which in turn indicates that production from the Spies Mine will come to a halt early in April of 1955.

On 4th level, the Old Spies orebody, development in ore was begun in June. One top-timber transfer was driven above 4th level and mining raises and drifts were advanced on all subs between 3rd and 4th level elevations. It was found the only near merchantable ore was located on the 3rd level and the first two subs below that elevation. It will be necessary to mix this ore with the ore from Spies East Deposit in order to realize a marketable product. That means that when the Spies East Deposit is depleted, mining in this area will also be completed.

Underground drilling has been carried on in the Spies Mine throughout the year in exploring for additional ore, at depth, below the 8th level in the Spies East Deposit. An estimate was prepared and submitted to Ishpeming and Cleveland indicating a recoverable amount of 1,500,000 tons of ore. However, the cost of development for this amount of ore makes the possibility of mining this tonnage prohibitable. At the end of the year, one final drill hole is being drilled from the Old Spies 6th level drift toward the Allen-Carlson properties in an attempt to find ore that will supplement the Spies East tonnage in order to help write off part of the total capital investment. The results from this drilling in the Allen-Carlson area should be known by March of 1955.

b. Timbering

Regular wood stull timber was used for support in transfer drifts and very little additional support has been needed underground other than repair and replacement of the timber in the transfers. The following is the comparative timber statement:

<u>Kind</u>	<u>Lineal Feet</u>	<u>Avg. Price</u>	<u>1954 Amount</u>	<u>1953 Amount</u>
Lagging	16,944	.01756 pc.	297.62	1,918.08
Poles	17,138	.0379 "	648.95	1,280.91
Stull Timber	3,382	.1942 ft.	656.81	838.85
Total			1,603.38	4,027.84

c. Explosives

The use of electric blasting has been continued in all types of work and the advantages offered by this method of detonation from a safety and ventilation standpoint warrant its continuance in preference to the conventional fuse blasting.

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7. UNDERGROUND (Continued)c. Explosives (Continued)

The following is the comparative explosives statement:

<u>Type</u>	<u>Unit Cost</u>	<u>Quantity</u>	<u>1954</u>		<u>1953</u>	
			<u>Amount</u>		<u>Amount</u>	
No. 2 Gelex	17.45 CWT	91,750 lb	16,010.39		23,819.51	
Spec. Gel 40%					873.20	
H. Velocity 40%					29.10	
Electric Caps	22.39 C	34,700	7,769.20		10,759.50	
Wire - Feet	5.06 M	214,660 ft	1,086.27		2,118.94	
Fuse - Feet	27.80 M	3,335 ft.	92.70		884.17	
Other			159.48		445.84	
Total Explosives			25,118.04		38,930.26	

d. Pumping

The problem of pumping highly-acid water from the Spies Mine in the past year has been almost completely remedied with the installation of a new stainless steel shaft pump in the bottom of the shaft. Due to caves between the 6th and 8th level workings, an increasing amount of acid water has been collecting on 8th level and in turn in the bottom of the shaft and this new shaft pump has almost completely solved the skip pit problem. It has been previously mentioned that a new flooded suction pumphouse was excavated at shaft on 4th level. This pumphouse will release the 4th level trench and pockets, which had served as a sump and pumphouse, for handling all ore being mined from the 4th level Old Spies orebody.

Good ventilation has been maintained in the Mine by the Aerodyne fan at the collar of the ventilation shaft. Only minor repairs have been required to this system.

8. COST OF OPERATINGa. Comparative Mining Costs

	<u>1954</u>	<u>1953</u>	<u>Increase</u>	<u>Decrease</u>
Production	146,740	212,344		65,604
Underground Costs	3.125	2.907	.218	
Surface Costs	.750	.514	.236	
General Mine Expense	.944	.709	.235	
Cost of Production	4.819	4.130	.689	
Depreciation	.055	.816		.761
Taxes	.125	.083	.042	
Loading and Shipping	.076	.107		.031
Total Cost at Mine	5.075	5.136		.061

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8. COST OF OPERATING (Continued)a. Comparative Mining Costs (Continued)

	<u>1954</u>	<u>1953</u>	<u>Increase</u>	<u>Decrease</u>
Budget: Estimated Cost	5.335	5.344		.009
Number of Shifts and Hours	2-8	2-8		
Number of Operating Days	208	249		41
Average Daily Hoist	705	853		148

b. Comparison of Labor and Supplies

	<u>1954</u> <u>Amount</u>	<u>Per-Cent</u>	<u>1953</u> <u>Amount</u>	<u>Per-Cent</u>
Labor	471,898.96	63.3	578,052.62	53.00
Supplies	<u>272,774.53</u>	36.7	<u>512,544.70</u>	47.00
Total	744,673.49		1,090,597.32	

c. Detailed Cost Comparison

	<u>1954</u>		<u>1953</u>	
	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>
<u>Underground Costs</u>				
1. Development	84,496.14	.576		
2. Mining	102,444.46	.698		
3. Trammig	68,505.50	.467		
4. Ventilation	37,579.72	.256		
5. Pumping	58,324.09	.397		
6. Compressor and Air Lines	20,807.09	.142		
7. Underground Superintendence	42,929.32	.293		
8. Maint: Pockets and Chutes	4,911.98	.034		
9. Mining Equipment	28,202.95	.192		
10. Levels and X-cuts	5,630.72	.038		
11. Shaft	<u>4,752.60</u>	<u>.032</u>		
Total Underground Costs	458,584.57	3.125	617,229.78	2.907
<u>Surface Costs</u>				
12. Hoisting	43,754.82	.298		
13. Crushing and Screening - Surf.	11,796.01	.080		
14. Stocking	22,502.07	.153		
15. Timber Yard	3,440.10	.023		
16. Dryhouse	10,890.05	.075		
17. Policing	313.16	.002		
18. General Surface	11,912.46	.081		
19. Maint: Headframe Bldg. & Equip.	2,044.46	.014		
20. Other Mine Bldgs.	<u>3,455.94</u>	<u>.024</u>		
Total Surface Costs	110,109.07	.750	109,150.99	.514

SPIES-VIRGIL MINE

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8. COST OF OPERATING (Continued)c. Detailed Cost Comparison (Continued)

	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>
<u>General Mine Expense</u>				
21. Geological Department	3,217.85	.022		
22. Mining Engineering Department	8,334.06	.057		
23. Mech. and Elect. Eng. Dept.	2,191.85	.015		
24. Safety Department	1,860.04	.013		
25. Research Laboratory	1,079.61	.007		
26. Analysis and Grading - Laboratory	8,916.99	.061		
27. Analysis and Grading - Shipping	1,480.74	.010		
28. Telephone & Safety Devices	7,539.76	.051		
29. Welfare - General	831.20	.006		
30. Welfare - District	439.25	.003		
31. Special Expense - Pensions	23.91	.000		
32. Special Expense - Retirements	1,301.86	.009		
33. Special Expense - Legal	849.64	.006		
34. Special Expense - Hygiene Clinic	802.20	.005		
35. Special Expense - Employment Office	392.45	.003		
36. Special Expense - Other	369.18	.002		
37. Ishpeming Office	15,390.00	.105		
38. Mine Office - Supt. and Clerks	28,647.71	.195		
39. Central Warehouse Overhead	4,341.60	.030		
40. Insurance - Property	923.94	.006		
41. Insurance - Group, Health & Life	4,991.98	.034		
42. Insurance - Group Annuity	4,036.01	.027		
43. Insurance - Catastrophe	1,019.08	.007		
44. Personal Injury - Comp. and Doctors	3,778.92	.026		
45. Personal Injury - Comp. Department	669.64	.005		
46. Vacation Pay - Current Year	17,583.08	.120		
47. Vacation Pay - Prior Year Adjustment	1,890.00	.012		
48. Holiday Allowance	9,393.00	.064		
49. Taxes - Unemployment Insurance	3,966.32	.027		
50. Taxes - Old Age Benefit	7,074.75	.048		
51. Pers. Injury - Hospital Deficit	433.11	.003		
52. Flooding Land - Rental	200.00	.001		
53. Rental - Ford Truck and Trailer	217.14	.001		
54. Mine Office Exp. Sup. Inventory Adj.	1,951.37	.013		
	<hr/>		<hr/>	<hr/>
Total General Mine Expense	138,455.50	.944	150,619.64	.709
COST OF PRODUCTION	707,149.14	4.819	877,000.41	4.130

SPIES-VIRGIL MINE

YEAR, 1954

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8. COST OF OPERATING (Continued)

c. Detailed Cost Comparison (Continued)

There is a noticeable increase in underground, surface and general mine expense costs over the 1953 items. This can be attributed mainly to two facts. First, the reduced operating schedule provided a smaller annual tonnage to charge off the overhead and, secondly, the depleting orebody resulted in less tonnage per day being hoisted which is illustrated by the fact that in 1953 the average daily hoist was 853 tons while in 1954 it was 705 tons per day.

9. TAXES

There was a slight increase in taxes in Iron River Township due to the increase in tax rate, in spite of the fact that the valuation was reduced on the Mineral Lands in the Township. The Spies Mine valuation in the Village of Mineral Hills remained the same as in 1953, but the tax rate was increased resulting in slightly higher taxes. In the City of Iron River, the Spies-Johnson fee remained the same as 1953, however, again there was an increase in tax rate. The Mineral Lands in the City of Iron River were decreased by \$5,000, but the resultant taxes showed an increase due to this tax rate. The following is a comparison of the taxes in the past two years in Iron County:

<u>Description</u>	<u>1954</u>		<u>1953</u>	
	<u>Valuation</u>	<u>Taxes</u>	<u>Valuation</u>	<u>Taxes</u>
<u>IRON RIVER TOWNSHIP</u>				
<u>SPIES MINE</u>				
NE $\frac{1}{4}$ of NW $\frac{1}{4}$ of Sec. 24, 43-35 40 A)				
SE $\frac{1}{4}$ of NW $\frac{1}{4}$ of Sec. 24, 43-35 40 A)				
Virgil Mine Lease No. 51)	35,000	875.00	35,000	840.00
SW $\frac{1}{4}$ of NW $\frac{1}{4}$ of Sec. 24, 43-35 40 A)				
Pers. Prop., Stockpiles, Supplies & Equip.	<u>400,000</u>	<u>10,000.00</u>	<u>400,000</u>	<u>9,600.00</u>
Total Spies Mine	<u>435,000</u>	<u>10,875.00</u>	<u>435,000</u>	<u>10,440.00</u>
Mineral Lands			4,525	108.63
Spies Dwellings and Mineral Lands	<u>1,250</u>	<u>31.25</u>	<u>1,250</u>	<u>30.00</u>
TOTAL IRON RIVER TOWNSHIP	<u>436,250</u>	<u>10,906.25</u>	<u>440,775</u>	<u>10,578.63</u>
Tax Rate		25.00		24.00
<u>BATES TOWNSHIP</u>				
Mineral Lands: Lot 3, SW $\frac{1}{4}$ of SW $\frac{1}{4}$ Sec. 18,			(250	8.58
43-34 23.70 A				
Tax Rate				34.00
<u>CRYSTAL FALLS TOWNSHIP</u>				
Mineral Lands	5,525	215.52	5,600	197.33
Tax Rate		39.00		37.00

SPIES-VIRGIL MINE

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SPIES-VIRGIL MINE
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9. <u>TAXES (continued)</u>	<u>Description</u>	1954		1953	
		<u>Valuation</u>	<u>Taxes</u>	<u>Valuation</u>	<u>Taxes</u>
	<u>VILLAGE OF MINERAL HILLS</u>				
	<u>SPIES MINE</u>				
	NE $\frac{1}{4}$ of NW $\frac{1}{4}$ of Sec. 24, 43-35 40 A)				
	SE $\frac{1}{4}$ of NW $\frac{1}{4}$ of Sec. 24, 43-35 40 A)				
	Virgil Mine Lease No. 51)	35,000	270.75	35,000	255.33
	SW $\frac{1}{4}$ of NW $\frac{1}{4}$ of Sec. 24, 43-35 40 A)				
	Pers. Prop, Stockpiles, Equip. & Supplies	400,000	3,094.27	400,000	2,918.04
	TOTAL SPIES MINE	435,000	3,365.02	435,000	3,173.37
	Spies Dwellings	1,250	9.67	1,250	9.12
	TOTAL VILLAGE OF MINERAL HILLS*	436,250	3,374.69	436,250	3,182.49
	Tax Rate		7.7356705		7.29509
	<u>CITY OF IRON RIVER</u>				
	<u>SPIES-JOHNSON FEE</u>				
	SE $\frac{1}{4}$ of NE $\frac{1}{4}$ of Sec. 24, 43-35 40 A	50,000	2,000.00	50,000	1,950.00
	NE $\frac{1}{4}$ of SE $\frac{1}{4}$ of Sec. 24, 43-35 40 A	50,000	2,000.00	50,000	1,950.00
	<u>Mineral Lands</u>				
	W $\frac{1}{2}$ of E $\frac{1}{2}$ of Sec. 24, 43-35 (McDermott Lease)	4,000	160.00	4,000	80.00**
	NE $\frac{1}{4}$ of NE $\frac{1}{4}$ of Sec. 24, 43-35 40 A	2,000	80.00	2,000	78.00
	NW $\frac{1}{4}$ of NE $\frac{1}{4}$ of Sec. 24, 43-35 40 A	1,600	64.00	1,600	62.40
	NW $\frac{1}{4}$ of SE $\frac{1}{4}$ of Sec. 24, 43-35 40 A	1,600	64.00	1,600	62.40
	NE $\frac{1}{4}$ of SW $\frac{1}{4}$ of Sec. 24, 43-35 40 A	1,400	56.00	1,400	54.60
	Mineral Lands	1,120	44.80	6,120	159.70
	Collection Fees		44.68		44.36
	TOTAL CITY OF IRON RIVER		4,513.48		4,441.46
	Paid in August, 1954		2,256.74		2,176.63
	Paid in January, 1955		2,256.74		2,264.83
	TOTAL CITY OF IRON RIVER	111,720	4,513.48	116,720	4,441.46
	Tax Rate		40.00		39.00

* Iron River Township and Village of Mineral Hills taxes are assessed on the same valuation.

** Paid one-half year only.

10. ACCIDENTS AND PERSONAL INJURY

a. Compensable Injuries

Following is a list of compensable injuries for 1954:

April 3 - Joseph Nora - Compound fracture of right little finger.
April 27 - Robert Grant - Abrasions and small lacerations of face.
July 15 - Hadar Peterson - Right inguinal hernia.

b. Accident Statistics

	<u>Frequency Rate</u>	<u>Severity Rate</u>
1954	23.65	.479
1953	19.13	.225

It might be noted here that the Cleveland-Cliffs Iron Company had one of its best years, from a safety standpoint, in 1954.

SPIES-VIRGIL

YEAR, 1954

SPIES-VIRGIL MINE
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11. POWER

There was less power consumed in 1954 than in 1953, because the Spies Mine was operating on a four-day per week schedule, as compared to the 1953 schedule of five-days per week. However, the maximum demand for 1954 was slightly below 1953 but for all practical purposes, it can be said that they were comparable since pumping and tramming demands were approximately the same for both years. The power cost per ton showed a considerable increase due to the smaller tonnage of ore hoisted from the Spies Mine during the year. There were no major delays due to power failure, although there were several short interruptions that were of no serious consequence.

<u>Year</u>	<u>Maximum Demand</u>	<u>Per K.W.H.</u>	<u>Total K.W.H.</u>	<u>Cost Per Ton</u>
1954	971	.0141	5,121,900	.493
1953	974	.0140	5,140,400	.340

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1. GENERAL

Mining operations were carried forward on a 3-shift, 5-day-per-week schedule from the first of the year to January 18 when the schedule was reduced to a 2-shift, 5-day-per-week schedule. Hoisting and stocking crews were put on a 3-shift schedule beginning on February 1 because the wet, sticky Alworth ore made it difficult to remove it from the surge pocket; crews resumed a 2-shift schedule on June 21.

Ore was placed in stockpile from January 4 to April 27. Loading of direct ore into cars from the pocket started on April 27 and continued until November 29, at which time stockpiling was resumed for the balance of the year. Loading of the Agnew-Alworth stockpile began on April 19 and continued until June 22.

The main gear on the cage hoist broke on April 29; a 54-B electric shovel from the Canisteo mine was used to replace the cage hoist for lowering timber and supplies; men used the ladderway to get to and from their working places. The cage hoist was put back into service on June 21. The mine was shut down during the week of November 22 for deer season.

Sorting of lean ore, in progress during December, 1953, was discontinued in January. Development in the lower Agnew ore body was disappointing both in quality and in quantity. No ore was mined during the year under the Agnew-South Agnew cross mining agreement. The South Agnew mine started pumping in the #3 shaft in March at an elevation of approximately 570 feet.

2. PRODUCTION-SHIPMENTS-INVENTORIES

Agnew Shaft

Tons Production	Tons Shipments	Tons Stockpile Inventory
104,245	106,353	7,573

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d. Production by Months - Agnew Shaft

<u>Month</u>	<u>Tons</u>
January	5,028
February	5,780
March	9,252
April	8,729
May	7,356
June	15,785
July	9,739
August	10,273
September	8,942
October	8,241
November	8,113
December	7,007
	<u>104,245</u>

3. ANALYSIS

a. Tonnage and Analysis of Ore Produced

<u>Agnew Shaft</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>	<u>Moisture</u>
Non-Bessemer	104,245	56.10	.075	10.24	.77	1.87	16.21

b. Tonnage and Complete Analysis of Ore Shipped

<u>Agnew Shaft</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Sil.</u>	<u>Mang</u>	<u>Alum</u>	<u>Lime</u>	<u>Mang</u>	<u>Sulf</u>	<u>Loss</u>	<u>Moist.</u>
Non-Bess	106,353	56.28	.077	9.93	.80	1.93	.12	.12	.009	6.10	16.24

c. Mine Analysis of Ore in Stockpile - Agnew Shaft

<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>	<u>Moisture</u>
7,573	53.49	.057	13.86	.63	1.07	14.09

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4. ESTIMATE of ORE RESERVES

a. Developed Ore - Factors Used

Merch

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

b. Ore Reserves as of December 31, 1954

Agnew Lease NE-NE, 11-57-21	Reserve 12-31-53	Mined 1954	Balance after Mining	Changed by Re-estimate	Reserve 12-31-54
Underground	225,789	104,245	121,544	-58,644	62,900
Open Pit				54,059	54,059
	<u>225,789</u>	<u>104,245</u>	<u>121,544</u>	- 4,585	<u>116,959</u>

c. Estimated Analysis of Reserves

NE-NE, 11-57-21

Merch Ore

<u>Non-Bessemer</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>
Underground	62,900	53.38	.075	13.62		
Open Pit	<u>54,059</u>	<u>55.80</u>	<u>.052</u>	<u>11.14</u>	<u>.61</u>	<u>1.69</u>
	<u>116,959</u>	<u>54.50</u>	<u>.064</u>	<u>12.47</u>	<u>.61</u>	<u>1.69</u>

Note: Open pit ore reserve is Hanna trespass on Agnew.
Underground reserve is estimated 1955 production
to deplete mine.

5. LABOR and WAGES

a. Comments

The labor supply was more than ample throughout the year. The number of employees has been reduced considerably from last year; the number of gangs of miners employed ranged from six in January

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to five in December. A general increase of \$0.05 was granted on July 1, 1954. The minimum rate for miners (Job Class 14) is now \$2.285 per hour. Union relations were favorable, and no written grievances were received during the entire year.

b. Comparative Statement of Production and Wages

<u>Production</u>	<u>1954</u>		<u>Combined</u>
	<u>Agnew</u>	<u>Alworth</u>	
Direct Ore	104,245	118,665	222,910
Number of Days Operated	247	247	247
Average Daily Production	422.04	480.43	902.47
Average Number of Men Working			124.75
<u>Tons Per Man</u>			
Miners			17.09
Underground			9.211
Mine			7.565
<u>Average Rate Per Day</u>			
Surface			\$16.16
Underground			\$21.12
Contract Miners			\$22.16
Mine			\$20.23
Amount Paid for Labor			\$596,126.46
Labor Cost Per Ton			\$2.674

6. SURFACE

a. Buildings and Repairs

There were minor maintenance repairs to buildings during the year.

b. Roads and Water Lines

There were no major changes. The Oliver has installed a water meter on our water line, and we are now being charged for water according to gallonage used.

c. Miscellaneous General Construction None

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7. UNDERGROUND

a. Shaft

Minor maintenance repairs to the shaft were carried on throughout the year. Skip and cage guides were replaced as needed.

b. Development

Drifts going north and south on the 590 sublevel, going north on the 560 sublevel, and drifts driven to explore the blanket formation were completed. The blanket formation was not thick enough to make mining in this area economical. Development in the channel proved disappointing both in quantity and quality.

c. Mining

Mining was carried on during the year with six gangs employed from January to May and five gangs for the balance of the year. The channel ore was so narrow that all mining was done in drift pillars, which was not conducive to high productivity per gang.

d. Timber, Explosives, Etc.

The supply of timber was ample and of good quality; tamarack was used in all drifting work.

Lineal Feet of Timber Used Per Ton	0.451
<u>Cost Per Ton</u>	
Timber	\$0.111
Lagging, Poles, Boards	\$0.099
Explosives	\$0.113
Pounds of Explosives Per Ton	0.531

e. Pumping and Drainage

The South Agnew mine started pumping the #3 shaft at an elevation of approximately 570 feet, resulting in a decrease in the quantity of water pumped by the Agnew mine.

8. BENEFICIATION

None

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9. MAINTENANCE and REPAIRS

A continuous program of maintenance and repair was carried on during the year with the majority of repair work being done on regularly scheduled shifts. Repair work done on Saturdays consisted of such items as changing skip guides and replacing skips, replacing bull gear on cage hoist, cleaning sumps, making electrical repairs on hoisting equipment, etc..

10. COST of PRODUCTION

a. Comparative Cost Statement

<u>Product</u>	<u>1954 Budget</u>	<u>1954 Actual</u>	<u>1953 Actual</u>
<u>Tons</u>			
Direct Ore	106,600	98,534	53,573
Stockpile Overrun		5,711	712
	<u>106,600</u>	<u>104,245</u>	<u>54,285</u>
South Agnew Cross Mining			<u>55,098</u>
			<u>109,383</u>
Average Daily Production		422.04	211.23
Tons Per Man Per Day-Combined		7.565	5.490
Days Operated		247	255
<u>Costs</u>			
<u>Total</u>			
Underground	\$3.051	\$2.838	\$4.768
Surface	0.371	0.313	0.359
General Mine	0.662	0.623	1.048
Cost of Production	<u>\$4.084</u>	<u>\$3.774</u>	<u>\$6.175</u>
Depletion-Original Cost		0.038	
<u>Depreciation</u>			
Plant & Equipment		0.215	0.086
Movable Equipment			0.005
Motorized Equipment		<u>0.002</u>	<u> </u>

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Taxes

Ad Valorem	\$0.054	\$0.114
Occupational		0.020
Royalty	0.070	0.074
Total Depletion, Depreciation, Taxes	\$0.379	\$0.299
Loading and Shipping	0.091	0.086
Total Cost at Mine	\$4.244	\$6.560
Administrative Expenses	0.050	0.050
Miscellaneous Expense & Income	0.049	0.022
Total Cost of Production	\$4.343	\$6.632
South Agnew Ore by Contract		2.348
Total Cost	\$4.343	\$4.474

b. Cost Comments

The following comments are not based on final year-end figures from Cleveland:

<u>Total Underground Costs</u>	were \$0.213 lower than the budget.
<u>Total Surface Costs</u>	were \$0.058 lower than the budget.
<u>Total General Mine</u>	were \$0.039 lower than the budget.
<u>Cost of Production</u>	was \$0.310 lower than the budget.

The main reason for the lower-than-budget costs is the fact that more tons were produced per man per day throughout the year than in 1953 and also more than was anticipated in making out the budget. The high tonnage per man per day was achieved by excellent employee cooperation.

11. EXPLORATION and FUTURE EXPLORATION

Exploration drifts in the lower ore body and into the blanket formation has been completed. No future exploration is anticipated.

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12. TAXES

	1954		1953		Increase Decrease	
	Assessed Value	Taxes	Assessed Value	Taxes	Assessed Value	Taxes
Mineral	\$35,070	\$4,127.38	\$46,166	\$5,103.65	-\$11,096	-\$976.27
Land, Bldgs, Mach.	6,532	768.75	6,532	722.12		46.63
<u>Personal Property</u>						
Equipment	3,406	400.85	3,080	340.48	326	60.37
Stockpile	2,409	283.52			2,409	283.52
	<u>\$47,417</u>	<u>\$5,580.50</u>	<u>\$55,778</u>	<u>\$6,166.25</u>	<u>-\$ 8,361</u>	<u>-\$585.75</u>
Avg. Mill Rate		117.69		110.55		7 6.45%

Mineral value decreased by mining and re-estimate by State increased reserve tonnage; but value per ton was lowered by State, showing an over-all decrease.

Tax Commission Reserve

May 1

Tons 1954	Tons 1953	<u>Increase</u>
403,101	329,756	73,345

Re-estimate by State included some deep ore not shown before.

13. ACCIDENTS and PERSONAL INJURY None
14. PROPOSED NEW CONSTRUCTION None
15. EQUIPMENT RECEIVED and PROPOSED NEW EQUIPMENT
- a. Equipment Purchased and Received 1954 None
- b. Proposed New Equipment None

ALWORTH LAND RESERVEANNUAL REPORTYEAR 19541. GENERAL

Operations were carried forward from the first of the year on a 2-shift, 5-day-per-week schedule. Hoisting and stocking crews were put on a 3-shift schedule beginning on February 1 because the wet, sticky ore made it difficult to get out of the surge pocket. Hoisting and stocking crews resumed a 2-shift operation on June 21. Ore was placed in pile from January 4 to April 27. Loading of direct ore into cars from the pocket started on April 27 and continued until November 29, at which time stockpiling was resumed for the balance of the year. Loading of the Agnew-Alworth stockpile began on April 19 and continued until June 22. The main gear on the cage hoist broke on April 29 and was put back into service on June 21; in the meantime, a 54-B electric shovel from the Canisteo mine was used to replace the cage hoist for lowering supplies and the men used the ladderway to get to and from working places. The mine was shut down on November 22 to allow for the deer season.

Pickands-Mather & Company stockpiled 50,146 tons of lean ore and 437,526 tons of taconite and shipped 13,566 tons of direct ore and 3,033 tons of concentrates for the season.

The Rhude-Gilbert Company stripped 264,000 cubic yards of material in 1954, of which 23,000 cubic yards were removed from the property, 53,000 cubic yards recasted, and 51,388 cubic yards moved to the M. A. Harina dump. A total of 28,000 tons of lean ore were placed in the lean ore dump and 205,368 tons of direct ore shipped for the year. 21,132 tons of crude ore have been stockpiled at the Boeing mine. A test run through the Boeing plant was made on this crude material and 67 tons of concentrates were shipped. Stripping operations were discontinued December 17.

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2. PRODUCTION-SHIPMENTS-INVENTORIES

<u>Alworth</u>	<u>Production</u>	<u>Shipments</u>	<u>Stockpile</u>
Underground Shaft	118,665	129,166	5,417
Open Pit Concentrates	67	67	
Open Pit Direct	<u>205,368</u>	<u>205,368</u>	
	324,100	334,601	<u>5,417</u>

3. ANALYSIS

a. Analysis of Production

<u>Alworth</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>	<u>Moisture</u>
Underground	118,665	56.42	.078	9.67	.81	1.93	15.71
Open Pit Concentrates	67	55.60	.072	12.27	.87	1.78	10.80
Open Pit Direct	<u>205,368</u>	<u>56.73</u>	<u>.070</u>	<u>9.88</u>	<u>.99</u>	<u>2.49</u>	<u>16.18</u>
	324,100	56.62	.073	9.80	.92	2.28	16.01

b. Analysis of Shipments

Underground	129,166	56.24	.077	9.84	.82	1.90	16.77
Open Pit Concentrates	67	55.60	.072	12.27	.87	1.78	10.80
Open Pit Direct	<u>205,368</u>	<u>56.73</u>	<u>.070</u>	<u>9.88</u>	<u>.99</u>	<u>2.49</u>	<u>16.18</u>
	334,601	56.54	.073	9.86	.92	2.26	16.41

c. Analysis of Ore in Stockpile

Underground	5,417	58.53	.078	7.10	.76	2.10	17.54
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d. Complete Analysis of Shipments

<u>Alworth</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>Moisture</u>
Underground	129,166	56.24	.077	9.84	.82	1.90	.08	.08	.011	6.32	16.77

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4. ESTIMATE of ORE RESERVES

a. Developed Ore - Factors Used

	Cubic Feet Per Ton	<u>Per Cent</u> Rock	
		Deduction	Recovery
Merch	14	0	100
Siliceous Merch	14	0	100
Wash Concentrates	14	0	61
Low Grade Wash Concentrates	14	0	60
Lean Wash Concentrates	14	0	46
Retreat Concentrates	14	0	40

b. Estimate of Ore Reserves as of December 31, 1954

<u>Lease</u>	<u>Reserve</u> <u>12-31-53</u>	<u>Mined</u> <u>1954</u>	<u>Balance</u> <u>after Mining</u>	<u>Changed by</u> <u>Re-Estimate</u>	<u>Reserve</u> <u>12-31-54</u>
Alworth	1,449,295	340,699	1,108,596	-426,752	681,844

c. Estimated Analysis of Ore Reserves

<u>Alworth</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>
Bessemer Merch Open Pit	97,832	57.18	.030	9.91	.22	.48
Non Bess Merch Open Pit	386,460	58.26	.091	7.16	1.01	2.35
Non Bess Merch Underground	34,600	57.14	.075	8.00		
Bess Wash Concts Open Pit	8,236	57.45	.034	9.45		
Non Bess Wash Concts Open Pit	89,695	55.70	.058	12.92		
Non Bess Retreat Concts Open Pit	32,415	58.20	.078	10.32		
Non Bess Siliceous Merch Open Pit	32,606	52.73	.084	15.79	.40	1.60
	681,844	57.43	.075	8.95	.82	1.95
Bessemer Merch	97,832	57.18	.030	9.91	.22	.48
Non Bessemer Merch	421,060	58.17	.090	7.23	1.01	2.35
Non Bessemer Siliceous Merch	32,606	52.73	.084	15.79	.40	1.60
	551,498	57.67	.079	8.21	.84	1.97

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<u>Alworth</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>
Bessemer Wash Concentrates	8,236	57.45	.034	9.45		
Non Bess Wash Concentrates	<u>89,695</u>	<u>55.70</u>	<u>.058</u>	<u>12.92</u>		
	97,931	55.85	.056	12.63		
Non Bess Retreat Concentrates	32,415	58.20	.078	10.32		
Total Alworth Concentrates	<u>130,346</u>	<u>56.43</u>	<u>.062</u>	<u>12.05</u>	—	—
Grand Total Alworth	681,844	57.43	.075	8.95	.82	1.95

5. LABOR and WAGES

a. Comments

The labor supply was more than ample throughout the year and the number of employees was reduced considerably from last year. The gangs employed averaged from eleven in January to five in December. A general increase of \$0.050 was effective as of July 1, 1954. The minimum rate for miners is now \$2.285 per hour. Union relations were favorable with no written grievances received for the entire year.

b. Comparative Statement of Production and Wages

<u>Production</u>	<u>Agnew</u>	<u>Alworth</u>	<u>Combined</u>
Direct Ore	104,245	118,665	222,910
Number of Days Operated	247	247	247
Average Daily Production	422.04	480.43	902.47
Average Number of Men Working			124.75
<u>Tons Per Man Per Day</u>			
Miners			17.090
Total Underground			9.211
Total Mine			7.565
<u>Average Rate Per Day</u>			
Surface			\$16.16
Underground			\$21.12
Contract Miners			\$22.16
Total Mine			\$20.23

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Amount Paid for Labor \$596,126.46
 Labor Cost Per Ton \$ 2.674

6. SURFACE

a. Buildings and Repairs

Minor maintenance repairs to buildings were carried on throughout the year.

b. Roads and Water Lines

No major changes. The Oliver has installed a water meter on our water line and we are now being charged for water according to the gallonage used.

c. Miscellaneous General Construction None

7. UNDERGROUND

a. Ventilating Shaft No Changes

b. Development

A drift was driven north of the main belt drift to explore the west shoreline and proved that there was less ore in this area than was anticipated.

c. Mining

Mining was carried forward during the year with eleven gangs mining in January and five in December. The slices varied from six to fourteen feet high and from ten to twelve feet wide. Conveyor equipment has been removed and stored as the drift pillars were mined back.

d. Timber-Explosives-Etc.

The supply of timber was ample and of good quality; tamarack was used in all drifting work and jackpine in slicing work.

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<u>Used Per Ton of Ore</u>	
Lineal Feet of Timber	1.285
Pounds of Explosives	0.578
<u>Cost Per Ton</u>	
Timber	\$0.214
Lagging, Poles, Boards	0.247
Wire	0.024
Explosives	0.122

e. Pumping and Drainage

Small individual pumps were used in the working places to improve working conditions and to keep the ore from being slushed through the water in the drifts. Water was pumped out of the caves during the rainy season.

8. BENEFICIATION None

9. MAINTENANCE and REPAIRS

A continuous program of maintenance and repair was carried forward throughout the year with the majority of repair work done on regularly scheduled shifts. Repair work done on Saturdays consisted of such items as changing skip guides and replacing skips, replacing bull gear on cage hoist, cleaning sumps, making electrical repairs on hoisting equipment, etc..

10. COST of PRODUCTION

a. Comparative Cost Statement

<u>Product</u>	1954 <u>Budget</u>	<u>Actual</u>	
		1954	1953
Direct Ore	111,400	110,084	118,845
Stockpile Overrun		8,581	364
	<u>111,400</u>	<u>118,665</u>	<u>119,209</u>

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<u>Product</u>	<u>Budget</u> 1954	<u>Actual</u>	
		1954	1953
Average Daily Output		480.43	467.48
Tons Per Man Per Day (Combined)		7.565	5.490
Days Operated		247	255
<u>Costs</u>			
<u>Total</u>			
Underground Costs	\$3.833	\$3.195	\$3.807
Surface Costs	0.371	0.319	0.351
General Mine Expense	0.662	0.623	0.577
Cost of Production	\$4.866	\$4.137	\$4.735
Depletion-Original Cost		0.051	
<u>Depreciation</u>			
Plant and Equipment			
Motorized Equipment		0.001	
Development		0.009	0.014
<u>Taxes</u>			
Ad Valorem		0.051	0.006
Occupational			
Royalty		0.073	0.076
Total Depletion, Depreciation, Taxes		\$0.185	\$0.096
Loading and Shipping		0.114	0.085
Total Cost at Mine		\$4.436	\$4.916
Administrative Expense			
Miscellaneous Income and Expense		0.050	0.050
Total Cost of Production		\$4.486	\$4.966

b. Cost Comments

The following figures are not final year-end figures from Cleveland:

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Total Underground costs were \$0.638 lower than the budget.
Total Surface costs were \$0.052 lower than the budget.
Total General Mine was \$0.039 lower than the budget.
Cost of Production was \$0.729 lower than the budget.

The main reason for the lower-than-budget costs is the fact that more tons were produced per man per day throughout the year than in 1953 and also more than was anticipated in making out the budget. The high tonnage per man per day was achieved by excellent employee cooperation.

11. EXPLORATION and FUTURE EXPLORATION None

12. TAXES

	1954		1953		Increase Decrease	
	Assessed Value	Taxes	Assessed Value	Taxes	Assessed Value	Taxes
Mineral	\$156,228	\$25,424.54	\$186,324	\$28,736.75	-\$30,096	-\$3,312.21
Land, Bldgs, Mach.	6,941	1,129.58	10,602	1,635.15	- 3,661	- 505.57
<u>Personal Property</u>						
Equipment	933	151.84	934	144.06	- 1	7.78
Stockpile	2,968	483.00			2,968	483.00
	<u>\$167,070</u>	<u>\$27,188.96</u>	<u>\$197,860</u>	<u>\$30,515.96</u>	<u>-\$30,790</u>	<u>-\$3,327.00</u>
Avg. Mill Rate		162.74		154.23		7 5.52%

Mineral reserve re-estimated by State. Of the total tax shown above, \$24,148.72 is charged to outside companies in 1954, leaving at net to Alworth underground of \$5,993.88 as compared to \$6,367.24 in 1953.

Tax Commission Reserve

May 1

Tons 1954	Tons 1953	Increase
1,861,487	1,654,322	207,165

Re-estimate by State increased reserve.

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13. ACCIDENTS and PERSONAL INJURY None
14. PROPOSED NEW CONSTRUCTION None
15. EQUIPMENT RECEIVED and PROPOSED NEW EQUIPMENT None

CANISTEO MINEANNUAL REPORTYEAR 19541. GENERAL

Mining conditions were generally good throughout the year. Except for a short period at the beginning of the ore season when freezing temperatures, accompanied by rain and snow, delayed the start of ore and conveyor stripping operations for about one week, weather conditions were favorable for both mining and stripping operations.

Repair work on the concentrating plant and pit equipment, started in the fall of 1953, was carried on from the first of the year until the beginning of ore season. Moving and erection of the stripping conveyor equipment to the West Snyder was also under way during this period.

Construction of the second unit of Heavy-Media, started on June 24, 1953, was completed by May 1, 1954.

Pit cleanup, in preparation for the 1954 ore season, was started on April 19 on a 1-shift, 5-day-week basis and continued until the start of the ore season.

Loading of ore from stockpile was started on April 29 with 17,141 tons being loaded prior to the start of ore season.

Ore operations began on May 6 on a 2-shift, 5-day-week basis, with the third shift continuing on cleanup and lean ore removal. Because of a curtailment in ore requirements, a 4-day-week schedule was started on July 12 and continued to the end of the ore season on September 23. A total of 1,220,652 tons of gross crude ore was moved which included 72,889 tons of screen rock. This ore was produced from three separate leases in the pit at an average rate of 6,975 tons per shift.

The concentrating plant operated on the same schedule as the pit, receiving 1,147,763 tons of crude ore and producing 528,658 tons of concentrates at an average rate of 3,014 tons per shift.

After the shutdown of ore operations, ore was shipped from stockpile at intermittent intervals until November 20. A total of 22,597 tons of ore remained in stockpile at the end of the 1954 shipping season.

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Because of grade requirements, the fine ore plant did not operate during the 1954 season.

Conveyor-dragline stripping started on May 10 on a 3-shift, 5-day-week basis; in line with other pit operations, a 3-shift, 4-day-week schedule went into effect on July 12 and continued until September 27 when a fourth crew was added, increasing the shifts per week from 12 to 16 with all employees remaining on four days per week. This schedule remained in effect until shutdown of operations on October 30. A total of 587,089 cubic yards of surface overburden was removed at an average rate of 1,742 cubic yards per shift.

At the close of the ore season, pit operations were immediately diverted to truck stripping. A 16-shift-per-week schedule, employing four crews working four days per week, went into effect on September 27 and continued until November 20 when all pit operations were shut down. A total of 575,264 cubic yards was removed at an average rate of 4,261 cubic yards per shift. Approximately 30,000 cubic yards of this material were used to construct and raise tailings pond dykes.

There were no post ore season repairs to any pit or plant equipment. The shops were drained and completely shut down on November 26.

There was no exploratory drilling done during the year.

2. PRODUCTION, SHIPMENTS & INVENTORIES

a. Production by Grades

	<u>Crude</u>	<u>Wash</u>	<u>Retreat</u>	<u>Total</u>
Snyder	24,720	203,618	228,338	
Bovey	2,644	244,504	247,148	
Hemmens	<u>82,483</u>	<u>589,794</u>	<u>672,277</u>	
Total	109,847	1,037,916	1,147,763	

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<u>Concentrates</u>	<u>Wash</u>		<u>Retreat</u>		<u>Total</u>
	<u>Bessemer</u>	<u>Non Bessemer</u>	<u>Bessemer</u>	<u>Non Bessemer</u>	
Snyder	3,313	12,594	13,995	83,335	113,237
Bovey	293	2,331	20,180	88,473	111,277
Hemmens	<u>25,419</u>	<u>21,054</u>	<u>95,718</u>	<u>161,953</u>	<u>304,144</u>
Total	29,025	35,979	129,893	333,761	528,658

b. Shipments by Grades

	<u>Wash</u>		<u>Retreat</u>		<u>Concentrates</u>		<u>Total</u>
	<u>Bessemer</u>	<u>Non Bessemer</u>	<u>Bessemer</u>	<u>Non Bessemer</u>	<u>Bessemer</u>	<u>Non Bessemer</u>	
Snyder	3,507	12,619	15,131	79,046			110,303
Bovey			21,738	85,658	477	2,465	110,338
Hemmens	—	—	<u>98,126</u>	<u>151,409</u>	<u>25,777</u>	<u>20,202</u>	<u>295,514</u>
Total	3,507	12,619	134,995	316,113	26,254	22,667	516,155

c. Stockpile Inventories

	<u>Wash</u>	<u>Retreat</u>	<u>Total</u>
Snyder	117	5,117	5,234
Bovey		3,950	3,950
Hemmens	<u>1,114</u>	<u>12,299</u>	<u>13,413</u>
Total	1,231	21,366	22,597

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d. Production by Months

Month	<u>Crude Ore</u>						Total
	Snyder		Bovey		Hemmens		
	Wash	Retreat	Wash	Retreat	Wash	Retreat	
May	12,482	79,146		35,281	17,584	39,514	184,007
June					23,252	263,489	286,741
July				14,612	18,625	220,247	253,484
Aug.	9,956	36,588	2,644	110,193	11,727	66,544	237,652
Sept.	<u>2,282</u>	<u>87,884</u>		<u>84,418</u>	<u>11,295</u>		<u>185,879</u>
Total	24,720	203,618	2,644	244,504	82,483	589,794	1,147,763

Month	<u>Concentrates</u>						Total
	Wash	Retreat	Wash	Retreat	Wash	Retreat	
May	7,827	36,467	230	19,107	9,160	19,159	91,950
June	43				12,861	112,204	125,108
July	22	126	20	7,608	10,363	94,725	112,864
Aug.	6,639	18,354	2,374	47,234	7,661	31,583	113,845
Sept.	<u>1,376</u>	<u>42,383</u>		<u>34,704</u>	<u>6,428</u>		<u>84,891</u>
Total	15,907	97,330	2,624	108,653	46,473	257,671	528,658

3. Analysis

a. Crude Ore

	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>
Snyder Wash	24,720	46.87	.047	27.37
Retreat	203,618	46.42	.047	26.88
Bovey Wash	2,644	52.50	.091	18.10
Retreat	244,504	45.82	.085	27.82
Hemmens Wash	82,483	41.33	.039	34.24
Retreat	<u>589,794</u>	<u>39.48</u>	<u>.048</u>	<u>36.89</u>
	1,147,763	42.39	.055	32.74

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b. Tonnage & Analysis of Concentrates Produced

	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mn</u>	<u>Alum</u>	<u>Moist</u>
<u>Snyder</u>							
Bessemer Wash	2,897	57.88	.045	11.69	.19	.41	7.27
Non Bessemer Wash	11,509	57.48	.057	11.64	.25	.38	7.24
Bessemer Retreat	7,503	58.26	.041	12.16	.20	.55	7.86
Non Bessemer Retreat	42,138	57.44	.060	10.13	.35	.44	7.14
<u>Bovey</u>							
Non Bessemer Wash	2,168	55.05	.111	14.67	.30	.36	9.04
Bessemer Retreat	14,086	57.18	.035	12.96	.22	.68	8.46
Non Bessemer Retreat	56,071	56.34	.110	11.82	.33	.49	7.17
<u>Hemmens</u>							
Bessemer Wash	23,830	55.76	.037	11.37	.38	.40	7.48
Non Bessemer Wash	11,992	55.79	.057	11.25	.21	.36	8.54
Bessemer Retreat	80,632	55.85	.037	11.64	.36	.42	7.66
Non Bessemer Retreat	63,243	55.75	.073	10.77	.46	.39	8.00
<u>Canisteo</u>							
Bessemer Stockpile (1954)	29,970	56.20	.038	11.95	.40	.42	6.86
Non Bessemer Stockpile (1954)	182,619	56.54	.073	10.96	.46	.42	7.36
<u>Total</u>	528,658	56.41	.064	11.25	.39	.43	7.49

c. Tonnage & Analysis of Concentrates Shipped

	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mn</u>	<u>Alum</u>	<u>Lime</u>	<u>Mag</u>	<u>Sulf</u>	<u>Ign Loss</u>	<u>Moist</u>
<u>Snyder</u>											
Bessemer Wash	2,897	57.88	.045	11.69	.19	.41	.18	.30	.015	4.27	7.27
Non Bessemer Wash	11,392	57.48	.057	11.63	.25	.38	.18	.30	.015	4.82	7.20
Bessemer Retreat	7,503	58.26	.041	12.16	.20	.55	.18	.30	.015	3.11	7.86
Non Bessemer Retreat	37,021	57.34	.060	10.10	.35	.42	.18	.30	.015	6.36	7.08
<u>Bovey</u>											
Non Bessemer Wash	2,168	55.05	.111	14.67	.30	.36	.18	.30	.015	5.08	9.04
Bessemer Retreat	14,086	57.18	.035	12.96	.22	.68	.18	.30	.015	3.71	8.46
Non Bessemer Retreat	52,121	56.28	.111	11.87	.33	.49	.18	.30	.015	5.94	7.18

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	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mn</u>	<u>Alum</u>	<u>Lime</u>	<u>Mag</u>	<u>Sulf</u>	<u>Ign Loss</u>	<u>Moist</u>
<u>Hemmens</u>											
Bessemer Wash	23,830	55.76	.037	11.37	.38	.40	.18	.30	.015	7.38	7.48
Non Bessemer Wash	10,878	55.82	.057	11.24	.20	.36	.18	.30	.015	7.68	8.57
Bessemer Retreat	80,632	55.85	.037	11.64	.36	.42	.18	.30	.015	6.98	7.66
Non Bessemer Retreat	50,944	55.67	.075	10.69	.46	.39	.18	.30	.015	7.99	8.00
<u>Canisteo</u>											
Bessemer Stockpile (1954)	29,970	56.20	.038	11.95	.40	.42	.18	.30	.015	6.12	6.86
Non Bess Stockpile (1954)	182,619	56.54	.073	10.96	.46	.42	.18	.30	.015	6.46	7.36
Bessemer Stockpile (1953)	5,839	57.17	.032	12.06	.20	.39	.18	.30	.015	4.95	6.13
Non Bess Stockpile (1953)	4,255	57.31	.040	11.08	.16	.34	.18	.30	.015	5.82	5.25
<u>Total</u>	516,155	56.38	.064	11.27	.39	.43	.18	.30	.015	6.48	7.44

d. Mine Analysis of Ore in Stockpile

<u>Stockpile Balance</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mn</u>	<u>Alum</u>	<u>Moist.</u>
Canisteo	22,597	56.73	.070	10.99	.39	.45	7.78

4. Estimate of Ore Reserves

a. Developed Ore - Factors Used

<u>Concentrates</u>	<u>Cubic Feet Per Ton</u>	<u>Rock Deduction</u>	<u>Per Cent Recovery</u>
Wash	14	0	60.00
Lean Wash	14	0	50.00
Low Grade Wash	14	0	55.00
Lean Low Grade Wash	14	0	45.00
Retreat	14	0	33.00

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b. Ore Reserves as of December 31, 1954

<u>Lease</u>	<u>Reserve</u> <u>12-31-53</u>	<u>Mined</u> <u>1954</u>	<u>Balance</u> <u>After Mining</u>	<u>Changed</u> <u>by Re-estimate</u>	<u>Reserve</u> <u>12-31-54</u>
Bovey	1,666,662	111,277	1,555,385	132,329	1,687,714
Snyder	1,309,721	113,237	1,196,484	154,224	1,350,708
Hemmens	<u>2,425,314</u>	<u>304,144</u>	<u>2,121,170</u>	<u>- 29,252</u>	<u>2,091,918</u>
<u>Total</u>	5,401,697	528,658	4,873,039	257,301	5,130,340

c. Estimated Analyses of Reserves

<u>Concentrates</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>
<u>Bovey</u>						
Bessemer Wash	240,082	58.70	.026	9.16	.47	.43
Non Bessemer Wash	953,669	58.99	.077	9.37	.28	.48
Bessemer Retreat	37,601	57.84	.030	10.94		
Non Bessemer Retreat	<u>456,362</u>	<u>57.31</u>	<u>.075</u>	<u>10.07</u>		
	1,687,714	58.47	.068	9.56	.33	.47
<u>Snyder</u>						
Bessemer Wash	586,117	60.94	.038	9.19	.17	.32
Non Bessemer Wash	732,463	60.95	.055	8.30	.18	.33
Bessemer Retreat	23,604	59.30	.035	9.47		
Non Bessemer Retreat	<u>8,524</u>	<u>58.72</u>	<u>.046</u>	<u>9.47</u>		
	1,350,708	60.90	.047	8.71	.18	.33
<u>Hemmens</u>						
Bessemer Wash	740,392	59.36	.030	9.86	.26	.55
Non Bessemer Wash	831,580	57.78	.056	9.70	.41	.65
Bessemer Retreat	154,563	58.26	.033	10.45		
Non Bessemer Retreat	<u>365,383</u>	<u>57.11</u>	<u>.077</u>	<u>10.09</u>		
	2,091,918	58.26	.049	9.88	.34	.60
<u>Mine Totals</u>						
Bessemer Wash	1,566,591	59.85	.032	9.50	.26	.45
Non Bessemer Wash	<u>2,517,712</u>	<u>59.15</u>	<u>.064</u>	<u>9.17</u>	<u>.29</u>	<u>.49</u>
	4,084,303	59.42	.052	9.30	.28	.48

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<u>Concentrates</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Mang</u>	<u>Alum</u>
<u>Mine Totals</u>						
Bessemer Retreat	215,768	58.30	.033	10.43		
Non Bessemer Retreat	830,269	57.24	.076	10.07		
	<u>1,046,037</u>	<u>57.46</u>	<u>.067</u>	<u>10.14</u>		
Total Bessemer	1,782,359	59.66	.032	9.61	.26	.45
Total Non Bessemer	<u>3,347,981</u>	<u>58.68</u>	<u>.067</u>	<u>9.39</u>	<u>.29</u>	<u>.49</u>
	5,130,340	59.02	.055	9.47	.28	.48

5. LABOR & WAGES

a. Comments

Labor relations during the year were generally good. Because of curtailment in operations, none of the men hired during 1953 were recalled to work in 1954. A general across-the-board increase in wages of 5 cents per hour for all hourly employees went into effect on July 1.

b. Comparative Statement of Production and Wages

Production (Tons)	528,658
Number of Days Operated	88
Number of shifts Operated	175
Average Product per Shift (Tons)	3,014
Average Number of Men Employed	148
Product per Man per Day (Tons)	40.71
Average Wages Paid per Day	\$19.62
Total Amount Paid for Labor	\$254,895.82
Labor Cost Per Ton	\$0.482

6. GENERAL SURFACE

a. Buildings and Repairs

There were no buildings constructed at the mine during 1954. Repairs were of a very minor nature.

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b. Roads, Transmission Lines, Etc.

There was no road construction at the mine during 1954. Construction of 2800 feet of 2200-volt power line to serve the stripping conveyor in its new location on the West Snyder was started in October of 1953 and completed in April of 1954.

c. Miscellaneous General Construction

Construction of the second Heavy-Media unit, started June 24, 1953, was completed by January 1, 1954, except for some minor electrical work, remodeling, and belt splicing. This work was done in April, 1954, with the plant going into operation on May 7.

Construction of an off-take ditch and installation of overflow pipes in connection with the new tailings basin were started in December, 1953, and completed in January, 1954.

Moving and erection of all stripping conveyor equipment on the West Snyder forty, started in November, 1953, was completed in May, 1954.

Revision of the concentrate stockpiling system, which included widening of the track gauge for more stability, and installation of equipment for automatic travel was started in October, 1953, and completed in April, 1954.

During October and November, in order to avoid pumping tailings all the way out to the new tailings basin, the west dyke of the old basin was raised approximately five feet and a cross dyke was constructed to divert the tailings to the northwest corner of the old basin where a culvert was placed to carry the tailings into the new basin. Material for the dyke work was hauled from the stripping operation in the North Bovey.

Because the amount of water from the existing fresh water well was gradually decreasing, it was found necessary to use water from the pit in order to have an adequate supply. This was done by running a pipeline from the pit dewatering pipeline to the water tank, making it necessary to install a chlorinator so that the water from the pit could be used in the domestic water system. Piping and ditching work was done in July and the chlorinator was installed in November.

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7. OPEN PIT

a. Stripping

Truck stripping was started on September 15 on the third shift; on September 27, after the end of ore season, a 16-shift-per-week schedule was put into effect and continued until pit operations were shut down on November 20. Truck stripping during 1954 was covered by E&A No. CC-650 which called for the removal of 500,000 cubic yards of surface, cretaceous, and lean ore at a cost of \$0.295 per cubic yard. A total of 575,264 cubic yards was removed at a cost of \$0.243 per yard and at an average rate of 4,261 cubic yards per shift.

Approximately 90 per cent of the material moved was surface overburden from the North Bovey forties on the north side of the pit. The remaining 10 per cent was cretaceous and lean formation from the same area. Ideal weather and good equipment availability made operating conditions very favorable.

Conveyor-dragline stripping was started on May 10 on a 3-shift, 5-day-week schedule; on July 12, to conform with other mine operations, a 3-shift, 4-day-week schedule was put into effect and continued until September 27 when an additional crew was added, increasing the number of shifts per week from 12 to 16, with all employees remaining on 4 days per week. The 16-shift-per-week schedule remained in effect until the operation was shut down on October 30.

Conveyor stripping during 1954 was covered by E&A No. CC-634 which provided for the removal of 900,000 cubic yards of surface overburden at a cost of \$0.222 per cubic yard. A total of 587,089 cubic yards was removed at a cost of \$0.306 per cubic yard and at an average rate of 1,742 cubic yards per shift. This operation suffered considerably from the type of material encountered, especially at the beginning of the season when the ground was saturated from rain and snow in the first part of May. The material in the top half of the cut was a very sticky blue clay that plugged up the screening plant and transfer points and built up on the return rollers. This situation was alleviated somewhat by loading directly into trucks when the screening plant was down, necessitating standby trucks, however, and thus adding to the cost of operation.

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From June 14 to July 12, trucks were used exclusively while the #1 conveyor was moved down on the bottom cut. When conveyor stripping was resumed, some improvement was noted; however, the bottom half of the cut contained layers of very rocky hard pan material which was also very difficult to move. It was necessary to put on the smaller, heavy duty bucket on the dragline in order to break through this hard pan.

In addition to delays caused by the type of material handled, this operation also suffered from a considerable amount of mechanical downtime. The drive mechanism on the wobbler caused a good share of the trouble, and it is anticipated that this mechanism will require extensive repairs or revision before the start of next year's operation.

Following is a tabulation by leases of all the stripping moved during 1954:

<u>Lease</u>	<u>Surface</u>	<u>Cretaceous</u>	<u>Lean Formation</u>	<u>Lean Ore</u>	<u>Total Cubic Yards</u>
Bovey	516,619	27,754	30,411		574,784
Snyder	587,089*				587,089
Hemmens				480	480
	<u>1,103,708</u>	<u>27,754</u>	<u>30,411</u>	<u>480</u>	<u>1,162,353</u>

* 587,089 Cubic Yards Conveyor Stripping

b. Open Pit Mining

The 1954 ore season started on May 6 on a 2-shift, 5-day-week schedule with the third shift on cleanup and lean ore removal. On July 12, because of curtailment in ore requirements, a 4-day-week schedule went into effect with the number of shifts per day remaining the same and with hourly employees working Monday through Thursday of each week. Ore operations were shut down on September 23.

The pit operated 175 shifts, producing a total of 1,220,652 tons of gross crude which included 72,889 tons of screen rock. An average of 6,975 tons of gross crude was mined per shift

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at a cost of \$0.283 per ton. Production of gross crude from the various leases is as follows:

<u>Leases</u>	<u>Tons</u>
Hemmens	691,213
Snyder	247,647
Bovey	<u>281,792</u>
	1,220,652

Included in the total tonnages noted above are 93,645 tons of gross crude ore mined from the various lean ore stockpiles in the pit.

Hemmens ore came from the upper horizon and included a large percentage of very lean low grade ore that required mixing with wash ore in order to make a satisfactory concentrate. Snyder ore came from the middle and West Snyder forties and from lean ore stockpiles; ore from the middle Snyder forty consisted of a hard, rocky ore mined from pockets on the bottom; ore from the West Snyder was a high grade wash ore. Bovey ore came from the West, South, and North Bovey forties; ore from the West Bovey came from the pit bottom near the taconite contact and is hard and rocky; ore from the South Bovey was mined in the upper horizon directly above the paint rock and contained seams of hard, rich taconite, making it difficult to treat by Heavy-Media; ore mined in the North Bovey forties, while somewhat rocky, produced a good grade of concentrates.

In addition to the crude ore, a total of 483,957 tons of pit rock, lean ore, and cleanup was moved in mining. Most of this material was moved on the night shift and amounted to .9 tons per ton of concentrates. The cost of removal was \$0.095 per ton of concentrates.

c. Pumping and Drainage

Except for the installation of equipment for automatic pumping, there were no changes in the pumping setup from the previous year. Automatic pumping will eliminate the need for pumpmen.

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Mine water is pumped out of the pit in two stages. Water not used in concentrating overflows to the north and eventually enters Prairie River. Approximately 2,773 gallons per minute were pumped from the pit at a cost of \$0.056 per ton of concentrates.

8. BENEFICIATION

a. Plant Operation

The concentrating plant operated on the same schedule as the pit, starting on May 6 and shutting down on September 27. Crude ore feed to the plant totalled 1,147,763 tons, from which were produced 528,658 tons of concentrates. Of this amount, 65,004 tons were wash concentrates and 463,654 tons were retreat concentrates.

The average concentrate production rate was 3,014 tons per shift at a weight recovery of 46.06 per cent of the tonnage going through the wash plant.

Except for periods when wash concentrates were being produced, the Heavy-Media plant operated on the same schedule as the washing plant. Operating 155 shifts, the Heavy-Media plant received 343,477 tons of feed and produced 224,308 tons of Heavy-Media concentrates at a weight recovery of 65.31 per cent of Heavy-Media feed. Coarse tailings amounted to 84,812 tons.

Installation of the second unit of Heavy-Media had a very favorable effect on the grade of the concentrates produced, making it possible to treat all sizes down to plus 1/8 inch.

The fine ore plant did not operate during the 1954 season due to grade requirements and to cutbacks in ore requirements.

Concentration data for the year is as follows:

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	Tonnage	Per Cent	Per Cent	Recovery	
		of Total Mined	Iron Dried	Tonnage	Iron Unit
<u>Washing Plant</u>					
Crude Ore and Rock Mined	113,997	100.00	42.24		
Less Rock Removed in Mining					
Crude Ore To Screening Plant	113,997	100.00	42.24		
Less Rock Rejects in Screening Plant	4,150	3.64	26.14		
Crude Ore Entering Mill	109,847	96.36	42.85		
Concentrates Produced	65,004	57.02	56.31	59.18	77.77
Tailings (by Deduction)	44,843	39.34	23.34		
<u>Retreat Plant</u>					
Crude Ore and Rock Mined	1,133,995	100.00	40.93		
Less Rock Removed in Mining	27,340	2.41	25.46		
Crude Ore to Screening Plant	1,106,655	97.59	41.31		
Less Rock Rejects in Screening Plant	68,739	6.06	25.83		
Crude Ore Entering Mill	1,037,916	91.53	42.34		
Concentrates Produced	463,654	40.89	56.45	44.67	59.55
Heavy Density Rejects	84,812	7.48	44.17		
Tailings (by Deduction)	489,450	43.16	28.66		

During the operating season, it was necessary to stockpile 220,721 tons of concentrates. Of this amount, 208,218 tons were removed, leaving a balance of 22,597 tons in stock on January 1, 1955.

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

<u>Washing Plant</u>		
<u>Source of Delay</u>	<u>Delay Hours</u>	<u>Per Cent of Total Hours Worked</u>
Out of Ore	8.42	0.58
Screening Plant Machines	36.66	2.58
Washing Plant Machines	2.58	0.18
Electric Power	3.92	0.28