

MORRIS MINE  
ANNUAL REPORT  
YEAR 1953

5. LABOR & WAGES

The labor force was increased from an average of 196 men the previous year to 205 men in 1953. The increase is due to the 10th level development.

Industry-wide wage increases of \$.08 $\frac{1}{2}$  an hour and \$.01 increase in job increment were put into effect June 12th and July 1st respectively.

6. SURFACE & UNDERGROUND

Extension of subsidence on the fringe of the old cave, forced abandonment of the road to the area where surface wells are operating and made it necessary to construct a new road north of the old rockpile.

The outlet to the settling basin northwest of the shaft washed away as a result of debris blocking the outlet flume. A new concrete apron bulkhead was built to reinforce the outlet.

The method of stockpiling was changed from trestle and larry-car to dumptor trucks. Revisions in the headframe were required to complete the change-over.

A phone system for improving communications between the hoisting engineer and shaft repair crew has been installed using a cage hoisting cable into which a conductor has been fabricated.

A self-powered track cleaner has been in operation during the year and is performing quite satisfactorily in keeping the track system clean.

Surface Pumping

The following table shows a comparison of the volume of water pumped from the various wells at the end of the year with a year ago.

<u>Well No.</u>	<u>G.P.M.</u> <u>Dec. 1953</u>	<u>G.P.M.</u> <u>Dec. 1952</u>
1	Down	Down
2	Down	Down
3	Down	86
3A	402	452
5	130	135
8	275	275
9	45	72
10	<u>345</u>	<u>Down</u>
	1197	1020

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6. SURFACE (Cont'd)

Surface Pumping

The average drop in the water level in the surface material above ledge since pumping started in 1937 to December 28, 1953 is shown in the table below:

<u>Test Hole</u>	<u>Drop 8-25-37 to 12-28-53</u>	<u>Depth Remaining To Ledge</u>
501	80.6	12.9
503	93.6	106.3
504	59.1	89.7
505	89.7	41.4
506	59.3	27.9
509	103.6	86.1
510	31.1	92.5
511	36.4	117.7
512	52.3	108.8
514	26.0	100.9
515	17.2	111.4
517	25.0	87.1
518	52.6	57.0
519	57.9	100.8
522	32.1	86.2
524	16.0	66.8
526	16.6	97.4
527	49.3	25.7
528	17.3	82.2
531	3.1	73.6
533	17.4	114.7
534	1.7	95.7
Total	870.3	1782.8
Average	39.6	81.0

Operating Expense for surface drainage amounted to \$14,096.00 compared with \$14,467.00 in 1952. The cost per ton was \$0.04 and \$.08 respectively.

7. UNDERGROUND:

a. Pumping

The bulk of the underground water is being handled by the two 1200 g.p.m. centrifugal pumps located on the 9th and 4th levels. Automatic operation of the pumps has resulted in a reduction in pumping costs despite the increase in wages.

The following table shows a comparison of the mine water pumped over a 5-year period:

<u>Year</u>	<u>4th</u>	<u>6th</u>	<u>7th</u>	<u>8th</u>	<u>9th</u>	<u>Total</u>
1953	76.1	37.1	77.0	546.2	882.4	1620.9
1952	94.6	27.1	69.2	495.8	971.4	1658.1
1951	107.8	36.3	67.4	431.5	945.8	1588.8
1950	89.2	24.7	79.9	324.6	700.4	1218.2
1949	95.0	24.5	88.6	316.4	667.8	1192.3

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7. UNDERGROUND: (Cont'd)

a. Pumping (Cont'd)

The following table shows a comparison of the pumping cost per ton for the last six years:

<u>Year</u>	<u>Cost Per Ton</u>
1953	\$.55
1952	.65
1951	.493
1950	.423
1949	.423
1948	.265

b. Development

The major development was the sinking of the hoisting shaft 170' to a depth of 30' below the 10th level. The development for the skip pit cleaning system was completed and also the loading pockets at the 10th level. Work was underway at the close of the year excavating and constructing the loading trench and excavating the shaft plat. This project was conducted with no interference to hoisting. Hoisting operations were continued on a 2-8 hour shift per day schedule and sinking on a 1-8 hour shift per day basis. Work will be continued on this development program in 1954 so mining can continue to lower elevations as ore areas above the 9th level are depleted.

Chase Lease #24

An average of five contracts were mining on this Lease during the year. Contract #30 has continued stope operations in Deposit #79 above the 8th level and also advanced additional stope development in this area. Contract's #4 and #10 have also continued stoping in the same Deposit between the 8th and 9th levels, the latter contract being the most productive of the three contracts mining in this Deposit. Contract #15 conducted stope development at the west end of this deposit during the year. Contract #20 has continued a caving operation in Deposit #33 between the 8th and 9th levels. On the basis of development and mining, the reserves in this deposit were reduced appreciably during the year due to a reduction in the ore line.

Fee Lands

An average of five contracts continued operations on Fee Lands during the year. Contract's #6, #8 and #11 have continued caving operations in Deposit #84-A, B, and C at the east end of the mine. Development and mining has outlined about 48,000 additional tons of reserves in these deposits. Mining in these deposits is reaching the 9th level elevation and consequently, 10th level development will be rushed into this area. Near the west end of Deposit #84-A, an area was mined by sub-level stoping and late in the year the pillars directly above the transfer drift above the 9th level were being recovered by caving.

One contract is conducting caving operations in Deposit #87 between the 8th and 9th levels and a small amount of mining was also done by caving in Deposit #76 above the 8th level during the year. Mining has not effected any significant change in reserves in these two deposits during the year.

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7. UNDERGROUND: (Cont'd)

Chase Lease #9

There was an average of nine contracts mining on this Lease throughout the year and the bulk of the production was from this area. Operations have again been concentrated in Deposit #33 between 8th and 9th levels. Sub-caving has been employed mostly in this deposit and a block cave area was also developed directly above the 9th level. A block approximately 200' x 60' x 100' in height was developed for caving by driving two parallel transfer drifts to the west. After caving progressed to the upper limits of the block, dilution from an adjacent mined area seriously hindered the operations. Wet conditions also hampered this first experiment with block caving.

Deposit #75-C, between the 8th and 9th levels, was the other significant producing area in this Lease. Caving and sub-level stoping have been employed in this area. No new ore has been developed by mining or development in this deposit.

Deposit #76 ranked next in the order of production in this Lease and one contract is conducting caving operations above the 8th level. Late in the year, development from the 9th level was started to enable mining to continue below the 8th level in this deposit.

Sub-level caving has continued to be used mostly in the various areas and sub-level stoping to a smaller extent.

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1. GENERAL:

During the first quarter of 1953 a stripping program was continued in both the East and West Pit areas. A total of 123,795 cubic yards of overburden and 20,940 cubic yards of rock were moved from January 2nd through March 19th on a 3 shift per day, 5 day per week schedule. One churn drill rig was utilized throughout these months drilling blast holes in the Webster Pit and exploring in the Norwood Lease. Following the termination of the stripping program all equipment was thoroughly checked and all necessary repairs were made.

Because of the numerous changes and additions to the mill, it was necessary to maintain a repair crew from the first of the year until the opening of the plant on April 27th. After commencing operations during the last week of April, the mill was run continuously until September 30th. A total of 342,390 tons of crude ore was milled from which 124,605 tons of concentrates were produced. Average grade (dried) for this product was 53.39% Iron, 0.308% Phos., 10.23% Sil., and 0.057% Sul., with a natural moisture content of 7.01%. Also completed during the operating season was the stripping of 72,990 cubic yards of rock from the East Pit. The major development project completed in the pit during the summer was the construction of a new entrance to the pit, changing the entrance to the mining area from the foot, to the hanging side of the formation.

Stripping was again commenced on October 1st with 133,860 cubic yards of overburden and 80,480 cubic yards of rock being moved by the end of December making a yearly grand total of 432,065 cubic yards. Exploration by churn drilling was started again in the fall and a diamond drilling program, initiated earlier in the summer, was also continued during this period.

The repair program in the mill also began again in October and continued throughout the remainder of the year.

2. PRODUCTION, SHIPMENTS AND INVENTORIES:

a. Operating Schedule:

	<u>No of Days</u>	<u>Shifts Per Day</u>	<u>Hours Per Shift</u>	<u>Total Shifts</u>
Pit Operating - 1953	96	1 & 2	8	188
Pit Operating - 1952	70	2	8	140
Mill Operating - 1953	111	1 & 3	8	334
Mill Operating - 1952	96	2 & 3	8	291

b. Pit:

	<u>1953 Tons</u>	<u>1952 Tons</u>
Webster Crude Ore - Pit to Surge Pile . . . . .	324,685	201,740
Portland Crude Ore - Pit to Surge Pile . . . . .	16,800	-
Total Crude Ore - Pit to Surge Pile . . . . .	341,485	201,740
Average Total Crude Ore Per Day . . . . .	3,557	2,882
* Average Total Crude Ore Per Shift . . . . .	1,816	1,441
Average Total Crude Ore Per Man Day . . . . .	59.79	44.33

\* Includes every shift that ore was hauled and therefore does not exclude delays.

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2. PRODUCTION, SHIPMENTS AND INVENTORIES: (Con't)

c. Mill:

	1953 <u>Tons</u>	1952 <u>Tons</u>
Crude Ore - Surge Pile to Mill . . . . .	342,390	199,698
Webster Conc. - Pocket in Cars . . . . .	118,481	51,166
Webster Conc. - Pocket to Stockpile . . . . .	-	8,341
Portland Conc. - Pocket in Cars. . . . .	6,134	-
Total Ohio Conc. Produced. . . . .	124,615	59,507
Average Total Concentrates Per Day . . . . .	1,123	620
Average Total Concentrates Per Shift . . . . .	374	204
Average Total Concentrates Per Man Day . . . . .	18.42	9.53
Percent of Recovery. . . . .	36.39	29.80

d. Shipments: (Gross Tons)

<u>Grade</u>	<u>From Pocket</u>	<u>From Stockpile</u>	<u>Total Year</u>	<u>Remaining Ore in Stock</u>
Webster Concentrates - 1953	118,481	-	118,481	-
Portland Concentrates - 1953	6,134	-	6,134	-
Total - 1953	124,615	-	124,615	-
Webster Concentrates - 1952	51,166	8,341	59,507	-
Total - 1952	51,166	8,341	59,507	-
Grand Total to Date	175,781	8,341	284,122	-

e. Stockpile: (Gross Tons)

	1953 <u>Gross Tons</u>	1952 <u>Gross Tons</u>
In Stock January 1st	-	-
Placed in Stockpile	-	8,341
Total	-	8,341
Removed from Stockpile during Year	-	8,341
Stockpile Balance December 31st	-	-

f. Production by Months:

	CRUDE ORE				CONCENTRATES			
	Year 1953			1952	Year 1953			1952
	Webster Crude	Portland Crude	Total Crude	Total Crude	Webster Conc	Portland Conc	Total Conc	Total Conc
April	4,900	-	4,900	-	880	-	880	-
May	67,640	-	67,640	20,180	23,215	-	23,215	6,155
June	70,940	3,700	74,640	3,680	22,916	1,280	24,196	288
July	66,540	-	66,540	-	21,833	-	21,833	-
August	45,120	13,100	58,220	40,940	18,200	4,854	23,054	12,022
September	69,545	-	69,545	74,360	31,437	-	31,437	23,587
October	-	-	-	57,520	-	-	-	17,455
<b>Total Tons</b>	324,685	16,800	341,485	196,680	118,481	6,134	124,615	59,507

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3. ANALYSIS:a. Analysis of Pit Crude Ore:

Year 1953				Year 1952			
Grade	Tons	Iron	Silica	Grade	Tons	Iron	Silica
Webster	324,685	41.31	28.64	Webster	201,740	42.79	29.01
Portland	16,800	41.31	28.64	Portland	-	-	-
Total	341,485	41.31	28.64	Total	201,740	42.79	29.01

b. Tonnage and Analysis of Concentrates Produced and Shipped:

Grade	Disposition	Year	Tons	Iron	Phos	Sil	Sul	Moist
Webster Conc.	Pocket	1953	118,481	53.39	0.308	10.23	0.057	7.01
Portland Conc.	Pocket	1953	6,134	53.39	0.308	10.23	0.057	7.01
Total Ohio Conc.	Shipped	1953	124,615	53.39	0.308	10.23	0.057	7.01
Total Ohio Conc.	Shipped	1952	59,507	54.08	0.190	12.21	0.030	9.64

c. Estimated Analysis and Production:

Concentrate	Percent		Iron	Sil	Phos	Sul	Moist
Tons	Year	Recovery					
116,000	1953	30%	55.00	9.80	0.200	0.035	7.50
56,443	1952	38%	55.10	9.80	0.268	0.016	7.50

4. ESTIMATE OF ORE RESERVES:a. Developed Ore - Factors Used:

	Cubic Feet Per Ton of Crude	Rock Deduction	Percent Recovery
Webster Concentrates	15	-	36%
Norwood Concentrates	15	-	42%

b. Ore Reserves as of December 31, 1953:

	Proven Ore			Total
	Webster	Portland	Ohio Norwood-Beaufort	
<u>Reserves Dec. 31, 1952</u>				
Crude	506,700	9,100	1,289,500	1,805,300
Recovery	30%	30%	40%	37%
Concentrates	152,000	2,730	515,800	670,530
<u>Mined 1953</u>				
Crude	324,685	16,800	-	341,485
Concentrates	118,481	6,134	-	124,615
<u>Balance after Mining</u>				
Crude	182,015	-7,700	1,289,500	1,463,815
Concentrates	33,519	-3,404	515,800	545,915
<u>Changed by Re-Estimate:</u>				
Crude	+80,485	+194,300	+76,900	+351,685
Concentrates	+60,981	+70,604	+58,100	+189,685
<u>Reserve Dec. 31, 1953:</u>				
Crude	262,500	186,600	1,366,400	1,815,500
Recovery	36%	36%	42%	40.5%
Concentrates	94,500	67,200	573,900	735,600

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4. ESTIMATE OF ORE RESERVES: (Con't)

c. Estimate of Total Reserves as of December 31, 1953:

Lease	Percent Recovery	Proven		Probable		Prospective	
		Crude	Conc.	Crude	Conc.	Crude	Conc.
<u>East Pit:</u>							
Webster	36%	262,500	94,500	-	-	-	-
Portland	36%	186,600	67,200	-	-	-	-
Imperial	100%	-	-	-	-	69,300	69,300
Total East Pit		449,100	161,700	-	-	69,300	69,300
<u>West Pit:</u>							
Ohio	42%	566,200	237,800	350,000	147,000	-	-
Norwood-Beaufort	42%	800,200	336,100	131,300	55,160	-	-
Beaufort (Old Workings)	50%	-	-	-	-	702,000	351,000
Titan	42%	-	-	-	-	212,300	89,200
Total West Pit		1,366,400	573,900	481,300	202,160	914,300	440,200
Total East and West Pits		1,815,500	735,600	481,300	202,160	983,600	509,500

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Lease	Percent Recovery	Total Proven & Probable		Total Proven, Probable & Prospective	
		Crude	Conc.	Crude	Conc.
<u>East Pit:</u>					
Webster	36%	262,500	94,500	262,500	94,500
Portland	36%	186,600	67,200	186,600	67,200
Imperial	100%	-	-	69,300	69,300
Total East Pit		449,100	161,700	518,400	231,000
<u>West Pit:</u>					
Ohio	42%	916,200	384,800	916,200	384,800
Norwood-Beaufort	42%	931,500	391,260	931,500	391,260
Beaufort (Old Workings)	50%	-	-	702,000	351,000
Titan	42%	-	-	212,300	89,200
Total West Pit		1,847,700	776,060	2,762,000	1,216,260
Total East and West Pits		2,296,800	937,760	3,280,400	1,447,260



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4. ESTIMATE OF ORE RESERVES: (Con't)

d. Estimated Analysis: (1954)

<u>Leases</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Sil</u>	<u>Sul</u>	<u>Moist</u>
Webster - Portland Conc.	(Dried) 110,000	53.50	0.299	9.98	0.060	-
	(Natural) 110,000	49.75	0.278	9.28	0.056	7.00
Norwood-Beaufort Conc.	(Dried) 40,000	51.40	0.160	8.00	0.100	-
	(Natural) 40,000	47.80	0.150	7.44	0.093	7.00

5. LABOR AND WAGES:

a. Comments:

Excluding transfers, the labor force at the Ohio remained practically constant throughout 1953 there being only 5 complete separations for reasons such as returning to school or entering the armed forces. Although not experienced in mining, an ample labor supply was available at all times because of the lack of industry in this section of Northern Michigan. Labor relations continued to be very good as no formal grievances were processed during the year.

Mr. Clifford Drake, who served as general mine foreman at the Ohio, was transferred to the Humboldt Mine in October to supervise the pit operation at that project. He was replaced at the Ohio by Mr. Leamon McGee, who had previously been handling the engineering work at the Republic development.

b. Report of Vacations Paid:

	<u>No.</u>	<u>Total</u>	<u>Total</u>	<u>Avg. Rate</u>	<u>Year</u>
	<u>Men</u>	<u>Hours</u>	<u>Amount</u>	<u>Per Hour</u>	
One week - 48 Hrs. - Vacation Paid	56	2,688	\$5,694.84	\$2.118	1953
One week - 48 Hrs. - Vacation Paid	50	2,400	\$4,464.84	\$1,860	1952

c. Comparative Statement of Production and Wages: (Operating-Ore)

	<u>Year</u>	<u>Year</u>
	<u>1953</u>	<u>1952</u>
Production - Concentrates (Long Tons) . . . . .	124,615	59,507
Number of Days Operated . . . . .	111	96
Number of Shifts Operated . . . . .	334	291
Average Daily Product (Long Tons) . . . . .	1,123	620
Average Product Per Shift (Long Tons) . . . . .	374	204
Average Number of Men Employed. . . . .	61	61
Product Per Man Per Day (Total Men) . . . . .	18.41	9.53
Average Wages Per Man Per Day . . . . .	\$17.96	\$15.76
Total Amount Paid for Labor During Operating		
Season . . . . .	\$121,587.24	\$92,270.92
Labor Cost Per Ton. . . . .	\$0.976	\$1,551

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5. LABOR AND WAGES: (Con't)d. Report of Men Hired, Transferred, and Separated:

	<u>Start of Month</u>	<u>Hires</u>	<u>Returns from Temp. Lay-off</u>	<u>Total</u>	<u>Final Separation</u>	<u>Temp. &amp; Perm. Trans.</u>	<u>End of Month</u>
January	49	-	3	52	-	-	52
February	52	-	-	52	-	-	52
March	52	-	-	52	-	-	52
April	52	4	6	62	-	-	62
May	62	-	-	62	-	-	62
June	62	2	-	64	-	-	64
July	64	2	-	66	-	-	66
August	66	2	-	68	2	-	66
September	66	1	-	67	3	-	64
October	64	-	-	64	-	6	58
November	58	1	-	59	-	4	55
December	<u>55</u>	<u>-</u>	<u>-</u>	<u>55</u>	<u>-</u>	<u>1</u>	<u>54</u>
Total	49	12	9	70	5	11	54

The above table includes only hourly rate employees and mine payroll salaried employees.

e. Annual Statement of Labor:

<u>MINE PAYROLL:</u>	<u>Statistical Men</u>	<u>Hours</u>	<u>Amount</u>	<u>Average Rate</u>
<u>Hourly Employees:</u>				
Straight Time	82 $\frac{3}{4}$	112,516	\$190,723.60	1.695
Overtime	4 $\frac{1}{2}$	6,102	5,941.02	.974
Shift Differential - Aft.	23 $\frac{3}{4}$	32,389	1,981.24	.062
Shift Differential - Nite	14 $\frac{1}{2}$	19,732 $\frac{1}{2}$	1,963.09	.099
Holiday - Allowance	-	2,656	5,171.68	1.947
Sub Total	82 $\frac{3}{4}$	112,516	\$205,780.63	1.829
Vacation Pay Accrual	-	-	6,619.84	-
Retro-Wage Adjustment	-	127,927	32,142.68	.251
Total Hourly Employees	82 $\frac{3}{4}$	112,516	\$244,543.15	2.173
<u>Salaried Employees:</u>				
Mine Payroll	2 $\frac{3}{4}$	3,757 $\frac{1}{2}$	11,923.53	3.163
Total Mine Payroll	85 $\frac{1}{2}$	116,273 $\frac{1}{2}$	\$256,466.68	2.206
<u>General Payroll:</u>				
Salaried: Straight Time	4 $\frac{1}{4}$	5,933	13,420.81	2.262
Overtime	-	202	121.42	.601
Holiday	-	17 $\frac{1}{2}$	33.07	1.890
Labor from Other Mines	8 $\frac{3}{4}$	11,889 $\frac{1}{4}$	26,122.59	2.197
GRAND TOTAL LABOR:	98 $\frac{1}{2}$	134,096 $\frac{1}{4}$	\$296,164.57	2.209

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5. LABOR AND WAGES: (Con't)e. Annual Statement of Labor: (Con't)

<u>MINE PAYROLL:</u>	<u>Statistical</u> <u>Men</u>	<u>Hours</u>	<u>Amount</u>	<u>Average</u> <u>Rate</u>
<u>Distributed as Follows:</u>				
Operating Mine	39 $\frac{1}{4}$	53,650 $\frac{1}{4}$	\$121,587.24	2.266
Winter and Idle	13 $\frac{1}{2}$	18,398	50,177.04	2.727
Stripping	31	42,013 $\frac{1}{2}$	85,667.37	2.039
E&A CC-430:	1	1,469 $\frac{1}{2}$	3,416.10	2.325
Other Mines	1 $\frac{1}{4}$	554 $\frac{1}{4}$	1,138.39	2.053
Other Accounts	13 $\frac{1}{4}$	18,010 $\frac{1}{2}$	34,178.43	1.898
GRAND TOTAL AS ABOVE	98 $\frac{1}{2}$	134,096 $\frac{1}{4}$	\$296,164.57	2.209

AVERAGE NUMBER OF MEN

	<u>Mine Payroll</u>		<u>General</u> <u>Payroll</u>	<u>Total</u>	<u>Mine</u> <u>Avg Hrly</u> <u>Job Rate</u>
	<u>Hourly</u>	<u>Salaried</u>			<u>Class 10<math>\frac{3}{4}</math></u>
Average Year	56	2	3	61	
	<u>Days Mine</u> <u>Operated</u>	<u>Tons Ore</u>	<u>Cu Yds</u> <u>Stripping</u>	<u>Units Per</u> <u>Man Day</u>	<u>Labor Cost</u> <u>Per Unit</u>
Pit Crude Ore	95	341,485	-	-	-
Mill Concentrating	130	124,615	-	18.57	0.976
Stripping	136	-	432,065	82.27	0.198
DAYS TOTAL YEAR	251				

6. GENERAL SURFACE:a. Buildings and Repairs:

In order to provide additional storage space and to facilitate mill repairs, a 32' x 32' plant warehouse was constructed along the east side of the mill. Other new construction included two 14' x 14' oil houses for mill and garage lubricants.

Repairs and changes to the main garage and office buildings included a remodeling program which provided a private office for the superintendent and eliminated the need for employees to travel through the mine general storehouse when commuting between the garage and mill. The section of the roof covering the office and dry was also repaired as a part of the project.

In order to install a new classifier and conveyor belt along the south and west sides of the mill respectively, additional foundations were laid and the west door and stairway arrangement was modified. The bulk of this work was completed during April, May and June.

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6. GENERAL SURFACE: (Con't)

b. Roads, Transmission Lines, Etc:

In order to deliver power to a pump station in the Portland Lease after water began developing in the East Pit operation, and to provide an additional outlet for running the shovel, a transmission line was extended across the pit. This wire connected the main line along the north edge of the pit to a series of poles along the south side in the vicinity of the Webster-Portland Lease line. Additional line changes were also made in the West Pit area as the coarse reject pile would have covered the main power line to the West Pit if it had been left in place. This line was also extended to the west during the year because of the advance of the stripping program.

As previously discussed a new road to enter the East Pit was completed during the summer, which offered a better grade advantage than the original development. Total length of the new road from the point of leaving the old grade to the floor of the pit is 1,785 feet. A new dump was also developed along this road which will shorten the haul of waste material from the East Pit.

During the fall stripping program in the West Pit area a new connecting road between the south tailing pond dike and the north road into the pit area was constructed. The original road was a temporary installation and was placed over a proposed mining area. The new road will aid the hauling cycle when actual mining starts in the West Pit. Throughout the summer, coarse heavy media rejects were used to surface the haul roads in the area. This material when packed provided an excellent road surface and aided greatly in reducing tire costs.

Numerous other minor roads were constructed along the east end of the Webster Lease and in the Imperial Lease for diamond drilling.

c. Miscellaneous General Construction:

During the fall stripping, the dikes along the tailing pond were again reinforced. The dike enclosing the fine tailing settling area was raised 6' in order to increase the capacity of the basin.

A pump station and pipe line were installed at the East Pit entrance to handle water pumped from the pit operation. This pump directs water south of the mining area where it eventually drains into Bass Lake.

Throughout the year, numerous installations were made to provide water for the office, shop and dry. The original supply, a water hole formed by old Ohio Mine caves became impossible to use during the summer when the coarse reject pile began to fill and contaminate the pond. After failing to locate water by drilling in the immediate vicinity of the office, a line was run to the old West Portland Pit which was fed by springs. During late fall this area became dry and the old line to the caved area was again placed in use. It will be necessary to locate another source of water for the Ohio office and dry before the 1954 ore season commences.

The area surrounding the mill site was graded and enlarged during the fall. This will provide better drainage and additional space for maneuvering supply trucks throughout the area. A concrete platform for storing barrels of media was completed during the summer. Constructed along the northeast corner of the mill, it enables the heavy media operator to add 500 pounds of ferrosilicon to the mill circuit in a minimum of time.

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7. OPEN PIT:a. Stripping Operations - Webster Pit:

<u>Truck and Shovel</u>	<u>No. Days</u>	<u>Shifts Per Day</u>	<u>Total Shifts</u>
Year 1953	34	1, 2 & 3	74
Year 1952	55	1, 2 & 3	117
Program to Date	143	1, 2 & 3	303

Production: (Cubic Yards)

	<u>Estimated</u>
Total Scheduled Program	
E&A CC-430:	
Estimate (12-53)	180,000 Cu Yds - Surface
To develop all Proven and Probable Reserves	230,000 Cu Yds - Rock

	<u>1953</u>	<u>1952</u>	<u>Completed to Date</u>
	<u>Year</u>	<u>Year</u>	
<u>Actual Stripping</u>			
Surface	-	55,725	168,056
Rock	<u>85,901</u>	<u>87,270</u>	<u>173,171</u>
TOTAL	<u>85,901</u>	<u>142,995</u>	<u>331,227</u>
<u>Average Stripping Per Shift</u>			
Surface	-	1,476	1,167
Rock	<u>1,161</u>	<u>746</u>	<u>1,085</u>
TOTAL	<u>1,161</u>	<u>1,222</u>	<u>1,126</u>
<u>Estimated Cost Per Cu Yd</u>			
Surface	0.450	0.450	0.450
Rock	0.600	0.600	0.600
<u>Actual Cost Per Cu Yd</u>			
Surface	-	0.455	0.476
Rock	<u>0.595</u>	<u>0.385</u>	<u>0.481</u>
TOTAL	<u>0.595</u>	<u>0.413</u>	<u>0.483</u>

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7. OPEN PIT: (Con't)

b. Stripping Operations - Portland Pit:

Truck and Shovel

	<u>No. Days</u>	<u>Shifts Per Day</u>	<u>Total Shifts</u>
Year 1953	29	1, 2 & 3	79
Year 1952	1	2	2
Program to Date	30	1, 2 & 3	81

Production: (Cubic Yards)

	<u>Estimated</u>
Total Scheduled Program	
E&A CC-430:	
Estimate (12-53)	142,700 Cu Yds - Surface
To develop all Proven and Probable Reserves	115,800 Cu Yds - Rock

	<u>1953 Year</u>	<u>1952 Year</u>	<u>Completed to Date</u>
<u>Actual Stripping</u>			
Surface	86,679	2,400	89,079
Rock	20,310	-	20,310
TOTAL	106,989	2,400	109,389
<u>Average Stripping Per Shift</u>			
Surface	1,125	1,200	1,128
Rock	1,256	-	1,452
TOTAL	1,320	1,200	1,350
<u>Estimated Cost Per Cu Yd</u>			
Surface	0.450	0.450	0.450
Rock	0.600	0.600	0.600
<u>Actual Cost Per Cu Yd</u>			
Surface	0.404	0.696	0.412
Rock	0.466	0.000	0.466
TOTAL	0.415	0.696	0.422

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7. OPEN PIT: (Con't)c. Stripping Operations - Norwood-Beaufort Pit:Truck and Shovel

	<u>No. Days</u>	<u>Shifts Per Day</u>	<u>Total Shifts</u>
Year 1953	70	2 & 3	202
Year 1952	83	1, 2 & 3	234
Total Program to Date	153	1, 2 & 3	436

Production: (Cubic Yards)

	<u>Estimated</u>
Total Scheduled Program	
E&A CC-430:	
Estimate (12-53)	1,872,404 Cu Yds - Surface
To Develop all Proven and Probable Reserves	1,409,239 Cu Yds - Rock

	<u>1953</u> <u>Year</u>	<u>1952</u> <u>Year</u>	<u>Completed to Date</u>
<u>Actual Stripping</u>			
Contract - (Norwood)	-	109,058	136,308 *
Surface - (CCI Norwood)	112,326	272,730	385,056
Rock - (CCI Norwood)	68,199	-	68,199
Surface - (CCI Beaufort)	58,650	20,460	79,110
TOTAL	239,175	402,284	658,875
<u>Average Stripping Per Shift</u>			
Surface	1,196	1,253	1,140
Rock	1,259	-	1,259
TOTAL	1,184	1,253	1,174
<u>Estimated Cost Per Cu Yd</u>			
Surface	0.450	0.450	0.450
Rock	0.600	0.600	0.600
<u>Actual Cost Per Cu Yd</u>			
Surface	0.432	0.323	0.364
Rock	0.391	0.000	0.391
TOTAL	0.420	0.323	0.367

- \* 4,678 Cu Yds - LeBreque & Pierce for County Roads - Chgd. to Road Construction  
 5,120 Cu Yds - Jos Hamel - Gravel Roads and Area - Chgd. to Road Construction  
 102,476 Cu Yds - Lindberg & Sons - Contract  
24,034 Cu Yds - D.S.S. & A. Ry. for Railroad Spur  
 136,308 Cu Yds - Total Contract

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7. OPEN PIT: (Con't)

d. Detail of Stripping:

Webster Lease: (East Pit)

There was no overburden moved from the Webster Lease during 1953. The bulk of the stripping represented lean hanging rock which had to be moved from each cut in the pit before additional depth could be realized. One exception was the removal in February of 20,990 cubic yards of footwall unoxidized iron formation in order to complete the pit entrance road for the 1953 ore season.

Total yardage for the year amounted to 85,901 and was moved at a cost of \$0.597 per cubic yard including depreciation. Of this total 52,760 cubic yards were stripped during the operating months of April through September and 12,281 cubic yards were stripped during the first half of October. The years cost equalled the estimate of \$0.60 per cubic yard despite the higher cost of moving the footwall rock in February which amounted to \$0.97 per cubic yard. This higher cost was principally caused by higher drilling and blasting expenditures due to the extremely hard nature of the foot rock. Excellent fragmentation from the blasts facilitated loading throughout the year and kept costs at a minimum. However, because of the single shovel operation at the Ohio occasional delays were caused due to long moves during the operating months to transfer from an ore to a stripping face.

Portland Lease: (East Pit)

Overburden was stripped from the Portland Lease during the months of March, October and December, the total yardage amounting to 86,679. During March, the program was concentrated in the area immediately west of the Webster Lease and during October and December was moved to the strip of land between the two old Portland Pits.

During the operating season 20,310 cubic yards of rock were also moved from the Portland Lease. This material was for the most part silicious top bench iron formation and was stripped after the East Pit operation was extended to the west into the Portland Lease.

Total stripping for the year including both rock and earth from this lease was 106,989 cubic yards.

The total cost of moving Portland overburden during 1953 amounted to \$0.401 per cubic yard while rock was slightly higher at \$0.466. In each case these costs were well within the estimate of \$0.45 and \$0.60 including depreciation.

A new stripping dump was developed along the southern limits of the Portland Lease which was used for all Portland-Webster stripping following the operating season. This dump area, which was easily reached by a short haul and a flat grade compared to the original dump, helped to reduce costs during this period.



7. OPEN PIT: (Con't)

d. Detail of Stripping: (Con't)

Ohio - Norwood - Beaufort Leases: (West Pit)

The preparation of the proposed West Pit area continued during 1953 with a stripping program that included 112,326 cubic yards of overburden and 68,199 cubic yards of rock from the Norwood Lease, and 58,650 cubic yards of overburden from the Beaufort Lease. Total yardage from this area amounted to 239,175.

The stripping of overburden was undertaken during January and February within the first quarter of the year and again in October, November and December during the last quarter. Rock was also moved during November and December. The rock stripping represented material from a hard cemented layer of igneous and ferruginous boulders that occurred just above ore throughout the Norwood Lease. The depth of this rock formation varied from 5 feet to 28 feet.

Including depreciation, the cost of stripping overburden during 1953 was \$0.438 and the cost for rock was \$0.398. Although portions of the rock layer previously described had to be drilled and blasted, other sections were so weathered and soft that drilling and blasting costs were kept at a minimum and the low cost of rock stripping indicated above was realized. Although within the estimate of \$0.45, the surface stripping costs in the Norwood-Beaufort Lease were affected by many factors that tended to keep expenditures high. These included the frequent occurrence of numerous large boulders throughout the overburden, extreme water conditions when ledge was exposed, and the need for carefully maneuvering the shovel around old mine areas where the possibility of cave-ins existed. During January, water from old mine drifts that was partially under pressure seriously hampered operations. Also during this period, the need for brushing the thick groves of hardwood growing in these leases caused delays. Because of the type and size of this wood it was not possible to contract to have the material removed without cost.

e. Detail of Stripping Costs:

	Norwood-Beaufort Pit		
	Year 1953	Year 1952	Total To Date
<u>Cubic Yards Production:</u>			
Beaufort Surface	58,650	20,460	79,110
Norwood Surface	112,326	381,788	511,566
Norwood Rock	68,199	-	68,199
TOTAL	<u>239,175</u>	<u>402,248</u>	<u>658,875</u>
<u>Cost of Stripping Per Yard: (Surface and Rock)</u>			
Pit Operating	\$0.290	\$0.273	\$0.288
General Mine Expense	0.065	0.004	0.027
Cost of Production	0.355	0.277	0.315
Depreciation	0.065	0.046	0.052
Total Cost of Production	<u>\$0.420</u>	<u>\$0.323</u>	<u>\$0.367</u>
<u>E&amp;A CC-430: Amount Expenditure:</u>			
Surface	\$66,903.12	\$111,498.48	\$189,401.05
Rock	17,918.59	-	17,918.59
Total Surface and Rock	<u>84,821.71</u>	<u>111,498.48</u>	<u>207,319.64</u>
Depreciation	15,765.35	18,433.38	34,198.73
Total Expenditure	<u>\$100,587.06</u>	<u>\$129,931.86</u>	<u>\$241,518.37</u>
<u>Cost Per Yard: (Including Depreciation)</u>			
Cost of Surface	\$0.432	\$0.323	\$0.364
Cost of Rock	0.391	0.000	0.391
Total Cost of Production	<u>\$0.420</u>	<u>\$0.323</u>	<u>\$0.367</u>

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7. OPEN PIT: (Con't)e. Detail of Stripping Costs: (Con't)

	<u>Portland Pit</u>		
	<u>Year</u> <u>1953</u>	<u>Year</u> <u>1952</u>	<u>Total</u> <u>To Date</u>
<u>Cubic Yards Production:</u>			
Surface	86,679	2,400	89,079
Rock	20,310	-	20,310
TOTAL	<u>106,989</u>	<u>2,400</u>	<u>109,389</u>
<u>Cost of Stripping Per Yard: (Surface and Rock)</u>			
Pit Operating	\$0.296	\$0.588	\$0.303
General Mine Expense	0.079	0.048	0.079
Cost of Production	0.376	0.636	0.382
Depreciation	0.039	0.060	0.040
Total Cost of Production	<u>\$0.415</u>	<u>\$0.696</u>	<u>\$0.422</u>
<u>E&amp;A CC-430: Amount Expenditure:</u>			
Surface	\$31,877.70	\$1,530.80	\$33,408.50
Rock	8,384.32	-	8,384.32
Total Surface and Rock	<u>40,262.02</u>	<u>1,530.80</u>	<u>41,792.82</u>
Depreciation	4,238.30	143.76	4,382.06
Total Expenditure	<u>\$44,500.34</u>	<u>\$1,674.56</u>	<u>\$46,174.88</u>
<u>Cost Per Yard: (Including Depreciation)</u>			
Cost of Surface	\$0.404	\$0.696	\$0.412
Cost of Rock	0.466	0.000	0.466
Total Cost of Production	<u>\$0.415</u>	<u>\$0.696</u>	<u>\$0.422</u>
<u>Webster Pit</u>			
<u>Cubic Yards Production:</u>			
Surface	-	55,725	168,056
Rock	85,901	87,270	173,171
TOTAL	<u>85,901</u>	<u>142,995</u>	<u>341,227</u>
<u>Cost of Stripping Per Yard: (Surface and Rock)</u>			
Pit Operating	\$0.481	\$0.359	\$0.394
General Mine Expense	0.067	0.016	0.023
Cost of Production	0.548	0.375	0.417
Depreciation	0.047	0.038	0.066
Total Cost of Production	<u>\$0.595</u>	<u>\$0.413</u>	<u>\$0.483</u>
<u>E&amp;A CC-430: Amount Expenditure</u>			
Surface	-	\$28,520.65	\$70,697.91
Rock	\$47,060.31	25,036.63	71,836.04
Total Surface and Rock	<u>47,060.31</u>	<u>53,557.28</u>	<u>142,533.95</u>
Depreciation	4,085.93	5,467.62	22,155.09
Total Expenditure	<u>\$51,146.24</u>	<u>\$59,024.90</u>	<u>\$164,689.04</u>
<u>Cost Per Yard: (Including Depreciation)</u>			
Cost of Surface	-	\$0.455	\$0.476
Cost of Rock	\$0.595	0.385	0.481
Total Cost of Production	<u>\$0.595</u>	<u>\$0.413</u>	<u>\$0.483</u>

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7. OPEN PIT: (Con't)e. Detail of Stripping Costs: (Con't)E&A CC-430: Stripping Expenditures to Date:

	<u>Norwood Beaufort</u>	<u>Webster</u>	<u>Portland</u>	<u>Grand Total To Date</u>
Surface	\$189,401.05	\$70,697.91	\$41,792.82	\$301,891.78
Rock	17,918.59	71,836.04	-	89,754.63
Total Surface and Rock	207,319.64	142,533.95	41,792.82	391,646.41
Depreciation	34,198.73	22,155.09	4,382.06	60,735.88
Total Expenditure	\$241,518.37	\$164,689.04	\$46,174.88	\$452,382.29

f. Detail of Open Pit Mining:

Pit operations were started on April 27th and continued throughout September with a total of 341,485 tons of crude ore being placed on the surge pile during that period. Of this total 324,685 tons were mined from the Webster Lease and the 16,800 tons from the Portland Lease. Cost of producing crude ore was \$0.294 per ton.

As in 1952 the pit again operated on a two-shift basis and because of the need for rock stripping during the ore season the actual mining of crude was limited to 96 days. The tonnage indicated above represented approximately one and a half cuts from the full length of the pit area, the benches averaging 20-25 feet in height. For the most part the width of the enriched material continued as in 1952 to vary from 90 to 110 feet with the grade of the crude varying from the foot to the hanging limits of the pit with the best grade being along the foot contact. Similarly, the grading of the ore along the strike of the formation from limonitic areas to richer goethite areas also held true at greater depths. However, it was found that at depth in this area that the ore contained a larger quantity of calcium carbonate and aluminum oxide, which when concentrated produced a low iron-silica combination. In addition portions of this foot-wall at depth were not completely oxidized and therefore could not be accepted as mill feed.

A new pit entrance road was developed during May and June and placed in use during July. This road allowed the trucks to enter the mining area along the hanging side of the formation through the old East Portland Pit. This provided a grade advantage compared to the footwall entrance previously in use and eliminated one truck from the hauling cycle.

Water was encountered in the pit during the 1953 season, the largest quantity being concentrated in the central portion of the mining area. This problem was handled by pumping to a sump located at the pit entrance where a permanent electric pump set-up was installed to lift the water out of the pit where it eventually drained into Bass Lake.

Because of a more continuous mill operation during 1953, the Ohio churn drill operated on three shifts throughout the ore season and, in addition, the blast hole drill program was augmented by a second churn drill working on two shifts during July and August. The primary blasting was successful throughout the summer and practically no secondary drilling or blasting were necessary.

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7. OPEN PIT: (Con't)f. Detail of Open Pit Mining: (Con't)

The following tables outline the details of truck haulage, primary blasting and churn drilling for 1953.

	<u>TRUCK HAULAGE</u>			
	<u>Webster Pit</u>			
	<u>Crude Ore</u>	<u>Rock</u>	<u>Surface</u>	<u>Total</u>
January	-	-	-	-
February	-	1,396	-	1,396
March	-	-	-	-
April	245	254	-	499
May	3,382	742	-	4,124
June	3,547	890	-	4,437
July	3,327	1,063	-	4,390
August	2,299	379	-	2,678
September	3,673	185	-	3,858
October	-	855	-	855
November	-	-	-	-
December	-	-	-	-
<hr/>				
Total Loads	16,473	5,764	-	22,237
Number of Shifts	179	74	-	273
Avg Loads Per Shift	92.0	77.8	-	81.4

	<u>Portland Pit</u>			
January	-	-	-	-
February	-	-	-	-
March	-	-	2,104	2,104
April	-	-	-	-
May	-	-	-	-
June	185	374	-	559
July	-	226	-	226
August	655	310	-	965
September	-	444	-	444
October	-	-	3,537	3,537
November	-	-	-	-
December	-	-	228	228
<hr/>				
Total Loads	840	1,354	5,869	8,063
Number of Shifts	9	16	63	88
Avg Loads Per Shift	93.3	84.6	93.1	91.6

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7. OPEN PIT: (Con't)f. Detail of Open Pit Mining: (Con't)

TRUCK HAULAGE: (Con't)  
Norwood-Beaufort Pit

	<u>Crude Ore</u>	<u>Rock</u>	<u>Surface</u>	<u>Total</u>
January	-	2,100	1,993	4,093
February	-	717	1,339	2,056
March	-	-	-	-
April	-	-	-	-
May	-	-	-	-
June	-	-	-	-
July	-	-	-	-
August	-	-	-	-
September	-	-	-	-
October	-	1,440	-	1,440
November	-	3,237	1,547	4,784
December	-	578	3,033	3,611
Total Loads	-	8,072	7,912	15,984
Number of Shifts	-	101	103	204
Avg Loads Per Shift	-	79.9	76.8	79.1

PRIMARY BLASTING  
Webster Pit

	<u>Day</u>	<u>No. Holes</u>	<u>Tons Ore Broken</u>	<u>Tons Rock Broken</u>	<u>Tons of Mat. Broken Per Lb of Powder</u>
February	12	100	-	43,075	1.84
April	21-22	154	46,136	36,410	2.10
May	29	45	43,350	6,353	2.85
May	18	47	21,428	6,776	2.24
June	12-23	92	45,450	16,500	3.50
July	1-9-16-23	201	60,853	25,614	2.79
August	4-17-28	180	89,653	30,569	2.03
September	15	106	57,167	2,899	3.85
TOTAL	13	925	364,037	168,196	

Portland Pit

	<u>Day</u>	<u>No. Holes</u>	<u>Tons Ore Broken</u>	<u>Tons Rock Broken</u>	<u>Tons of Mat. Broken Per Lb of Powder</u>
April	22	17	1,988	2,435	2.12
May	18	41	20,200	1,006	2.24
July	23	14	12,830	-	2.74
TOTAL	3	72	35,018	3,441	

Norwood Pit

	<u>Day</u>	<u>No. Holes</u>	<u>Tons Ore Broken</u>	<u>Tons Rock Broken</u>	<u>Tons of Mat. Broken Per Lb of Powder</u>
November	20	25	-	11,948	4.51
December	14	40	-	20,600	5.5
TOTAL	2	65	-	32,548	
GRAND TOTAL	18	1,062	399,055	204,185	

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7. OPEN PIT: (Con't)f. Detail of Open Pit Mining: (Con't)TOTAL POWDER USEDPrimary Blasts:

	<u>Lb.</u> <u>EP #152</u>	<u>Lb.</u> <u>EP #137</u>	<u>XC-45</u> <u>Boosters</u>	<u>Plastic</u> <u>Primacord</u>	<u>Plain</u> <u>Primacord</u>
January	-	-	-	-	-
February	-	23,400	200	5,000	3,000
March	-	-	-	-	-
April	-	42,500	350	7,500	4,000
May	-	14,550	50	3,000	1,500
May	-	22,500	50	3,000	2,500
June	-	21,750	150	4,000	3,000
July	26,000	9,500	375	7,500	4,500
August	59,200	-	325	9,000	6,500
September	15,600	-	200	4,500	6,000
November	2,650	-	50	500	500
December	3,750	-	50	1,000	500
TOTAL	107,200	134,200	1,800	45,000	32,000
Price Per Unit	\$17.65 -	\$18.15 -	\$35.00 -	\$43.50 -	\$34.00 -
	Per 100 #	Per 100 #	Per 100 #	Per 1,000 Ft.	Per 1,000 Ft.
TOTAL	\$18,920.80	\$24,357.30	\$630.00	\$1,957.50	\$1,088.00

Total Powder Cost Primary Blasting \$46,953.60  
Cost Per Ton of broken material \$0.0778

Secondary Blast:

<u>40% Gel Ex</u> <u>1 1/4 x 8</u>	<u>6% Gel Ex</u> <u>1 1/4 x 8</u>	<u>60% HP</u> <u>Gel 5 x 5</u>	<u>Lighters</u>	<u>Cloverbrand</u> <u>Fuse</u>	<u>Dynamite</u> <u>1 1/4 x 8</u>	<u>Elect #6 Blast</u> <u>Caps</u>	<u>Caps</u>
300	250	2,000	500	3,000	750	900	1,000
\$17.50	\$18.75	\$22.50	\$9.00	\$9.46	\$19.28	\$11.69	\$15.75
Per 100#	Per 100#	Per 100#	Per 1,000	Per 1,000 Ft	Per 100#	Per 100	Per 1,000
\$52.50	\$46.88	\$450.00	\$4.50	\$28.38	\$144.63	\$105.21	\$15.75

Total Powder Cost Secondary Blasting \$847.85

CHURN DRILLING  
Webster Pit

	<u>Shifts</u>	<u>Holes</u> <u>Drilled</u>	<u>Footage</u> <u>Drilled</u>	<u>Avg Depth</u> <u>Per Hole</u>	<u>Ft Per</u> <u>Shift</u>	<u>Bits</u> <u>Used</u>	<u>Feet</u> <u>Per Bit</u>	<u>Cost</u> <u>Per Foot</u>
January	62	1,070	1,416	20	23.5	59	24	-
January	93	100	2,285	22.9	24.5	91	25.1	-
February	44	74	1,907	26	43	17	112	-
March	38	67	1,513	22.6	40	17	89	-
May	61	115	3,018	26.2	49.5	28	108	\$.796
June	67	169	3,131	18.5	47	30	104	.940
July	99	202	4,261	21	43	38	117	.956
August	91	184	4,180	22.5	46	36	118	.939
October	21	17	717	42	34	16	45	1.430
November	2	1	55	55	27	1	55	1.490
December	6	3	189	63	32	3	63	2.908
TOTAL	584	1,002	22,672	22.6	38.8	336	67.5	

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7. OPEN PIT: (Con't)f. Detail of Open Pit Mining: (Con't)

CHURN DRILLING: (Con't)  
Portland Pit

	<u>Shifts</u>	<u>Holes Drilled</u>	<u>Footage Drilled</u>	<u>Avg Depth Per Hole</u>	<u>Ft Per Shift</u>	<u>Bits Used</u>	<u>Feet Per Bit</u>	<u>Cost Per Foot</u>
March	12	15	474	32	40	6	79	-
April	10	22	421	19	42	6	70	2.037
July	8	14	350	25	44	4	88	.956
August	1	3	54	18	54	1	54	.939
September	13	13	368	28	28	6	61	1.639
November	17	9	475	53	27	20	24	1.771
December	<u>27</u>	<u>10</u>	<u>596</u>	<u>60</u>	<u>30</u>	<u>12</u>	<u>50</u>	<u>2.313</u>
TOTAL	88	86	2,738	31.8	31.1	55	49.8	

Norwood Pit

February	10	7	309	44	31	6	52	1.125
October	22	6	336	56	15	8	42	3.161
November	19	34	579	17	30	9	82	1.453
December	<u>16</u>	<u>30</u>	<u>561</u>	<u>19</u>	<u>19</u>	<u>5</u>	<u>112</u>	<u>1.487</u>
TOTAL	67	77	1,785	23.2	26.6	28	63.8	

Imperial

November	<u>14</u>	<u>3</u>	<u>123</u>	<u>41</u>	<u>9</u>	<u>5</u>	<u>25</u>	<u>5.740</u>
TOTAL	14	3	123	41	9	5	25	5.740

Well Drilling

February	<u>2</u>	<u>1</u>	<u>14</u>	<u>14</u>	<u>7</u>	<u>1</u>	<u>14</u>	<u>4.964</u>
TOTAL	2	1	14	14	7	1	14	4.964

GRAND TOTAL	<u>755</u>	<u>1,169</u>	<u>27,332</u>	<u>23.4</u>	<u>36.2</u>	<u>425</u>	<u>64.3</u>	
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The above churn drilling data includes exploration holes and regular blast holes. For the most part, holes drilled from April through August were blast holes with the remainder being drilled principally for exploratory purposes. As can be noted from the tables, the cost of drilling blast holes is considerably less than the exploration holes. This is chiefly because of the longer moves involved in exploring and because of the occasional need to penetrate rocky overburden.

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8. BENEFICIATION:a. 1953 Plant Production and Analyses:

	<u>Tons</u>	<u>% Wt.</u>	<u>Crude</u>	<u>% Fe</u>	<u>% P.</u>	<u>% SiO<sub>2</sub></u>	<u>% S.</u>
Pit Crude	348,831			41.31		28.64	
Plant Head	349,751			42.19		26.28	
H.M. Conc.	92,446	36.57	26.44	54.76		8.66	
H.M. Reject	160,378	63.43	45.85	33.86		40.22	
H.M. Feed	252,824	100.00	72.29	41.50		28.68	
Classifier Concentrate	32,169	39.67	9.20	53.37		10.99	
Spiral Tailing	48,917	60.33	13.98	43.80		22.48	
Spiral Feed	81,086	100.00	23.18	47.60		17.92	
Hydroseparator Overflow	15,841		4.53	46.81		18.38	
Calculated Plant Head	349,751		100.00	43.15		25.72	
<u>Concentrates</u>							
H.M. Concentrate	92,446	74.19	26.44	54.76		8.66	
Classifier Concentrate	32,169	25.81	9.20	53.37		10.99	
Calculated Total Concentrate (by plant analyses)	124,615	100.00	35.64	54.40		9.26	
Total Concentrate Shipped from Pocket	124,615*			53.39	0.308	10.23	0.057
Total Concentrate Stockpiled	None						
Total Concentrate (by car-top analyses)	124,615			53.39	0.308	10.23	0.057

@ 7.01% H<sub>2</sub>O the natural iron content = 49.65%

\* Webster Lease      118,481 Tons  
Portland Lease      6,134 Tons

b. Plant Operations:

The Ohio mill operated from April 27th through September 30th, with production being limited to only 880 tons during April because of the time consumed in conditioning the heavy media so desired gravities could be maintained. Total tonnage of concentrates for the year amounted to 124,615 produced from 349,751 tons of crude for a recovery of 35.64%. The slight discrepancy between the total crude noted here and that recorded previously in the report under the production records was caused by the added weight of a higher grade pit ore mined during September. Pit costs for the year were based on a crude production average of 20 tons per truck, but in computing a mill balance the total tonnage became slightly increased. The Ohio mill is not equipped with a weightometer to provide an accurate record of mill feed absorbed during a season.

The dried analysis of the product shipped during the year based on car-top samples averaged 53.39% Fe., 0.308% Phos., 10.23% Sil., and 0.057% Sul. Moisture for the year was 7.01% resulting in an average natural iron content of 49.65%.



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8. BENEFICIATION: (Con't)b. Plant Operations: (Con't)

As can be noted from the following tables outlining plant performance during the 1953 season, a considerable increase in mill efficiency was achieved as compared to 1952 operations. Although not shown in tables, a notable improvement in milling practice was also realized throughout the 1953 season. During September 31,322 tons of concentrate or 1,457 tons per day were produced representing a recovery of 44.36% with the product analyzing (dried) 52.63% Fe., 0.425% Phos., 9.03% Sil., and 0.046% Sul. The moisture for September ran 6.04%. The net feed rate to the mill during September was 174.7 long tons per hour with 143.5 LTPH being sent to the Heavy Media Plant. This can be compared with the May production of 23,215 tons or 1,040 tons per day representing a recovery of 33.81% and a net feed rate of 151.72 LTPH to the mill of which 98.75 LTPH were sent to the Heavy Media Plant.

Since up to the 1953 season, the mill had operated only 4 months which also was interrupted by a strike, it was necessary during the 1954 season to continue making changes in the mill circuit as additional information was gathered concerning the machinery as well as the ore. With a total of 9 months of mill operating time now completed, it is quite certain that the anticipated mill capacity and recovery will be realized throughout the future.

c. Plant Delays:

<u>Source of Delay</u>	<u>Hours</u>	<u>Per Cent of Total Delays</u>	<u>Percent of 2728 Working Hours</u>
Initial Startup of Plant	48.12	10.67	1.76
Startup of Plant after Weekends	6.33	1.40	0.24
Shutdown of Plant before Weekends	1.25	0.28	0.05
Feeding from Surge Pile	18.68	4.14	0.68
Apron Feeder	7.70	1.71	0.28
Speed Variator for tunnel feeder	2.08	0.46	0.08
5 x 12 Ripl Flo Screen	21.63	4.79	0.79
Symons Crusher	37.41	8.29	1.37
3 x 10 Simplicity Screen	59.28	13.14	2.17
5 x 12 Low Head Screen	2.58	0.57	0.09
Conveyors	71.60	15.87	2.62
Chutes, Feed Boxes, Lines	38.35	8.50	1.41
Pumps	11.63	2.58	0.43
Hydroseparator	2.76	0.61	0.10
Drum Separator	7.00	1.55	0.26
6 x 12 Low Head Drain Screen	6.09	1.35	0.22
6 x 12 Low Head Wash Screen	17.83	3.95	0.65
Crockett Magnetic Separators	2.67	0.60	0.10
Building up Specific Gravity and Volume of Media	17.63	3.91	0.65
Fresh Water Line	2.67	0.60	0.10
Power Failure	67.79	15.03	2.49
<b>TOTAL</b>	<b>451.08</b>	<b>100.00</b>	<b>16.54</b>

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8. BENEFICIATION: (Con't)d. Pit to Surge Pile - Time Distribution:

	<u>Hours</u>	<u>Percent of Total Delays</u>	<u>Percent of 1920 Hours</u>
Blasting in Pit	64.25	17.15	3.34
Shovel - Greasing	147.25	39.30	7.66
- Moving	24.50	6.54	1.28
- Repairs	10.50	2.80	0.55
Primary Hopper & Feeder	42.25	11.27	2.20
Scalping Screen	6.25	1.67	0.33
Jaw Crusher	25.50	6.80	1.33
No. 1 Conveyor	17.25	4.60	0.90
Power Failure	35.50	9.47	1.85
Bulldozing on Surge Pile	<u>1.50</u>	<u>0.40</u>	<u>0.08</u>
<b>Total Delays</b>	<b>374.75</b>	<b>100.00</b>	<b>19.52</b>
Miscellaneous Projects	12.00		0.63
Hauling Rock	351.25		18.29
Hauling Ore	<u>1182.00</u>		<u>61.56</u>
<b>Total Time</b>	<b>1920.00</b>		<b>100.00</b>

e. Hourly Operating Rates:

	<u>Tons</u>	<u>Gross Hours Operation</u>	<u>Net Hours Operation</u>	<u>LTPH Gross</u>	<u>LTPH Net</u>
<u>Pit Crude to Stockpile:</u>					
1953 Season	348,831	1920.00	1182.00	181.68	295.12
1952 Season	201,740	1125.00	938.42	179.32	214.98
<u>Stockpile to Plant:</u>					
1953 Season	349,751	2728.00	2276.92	128.21	153.61
1952 Season	199,698	2299.50	1655.67	86.84	120.61
<u>Heavy Media Feed:</u>					
1953 Season	252,824	2728.00	2276.92	92.68	111.04
1952 Season	128,349	2299.50	1655.67	55.82	77.52
<u>Spiral Feed:</u>					
1953 Season	81,086	2728.00	2236.09	30.01	36.26
1952 Season	61,051	2299.50	1567.62	26.55	38.95
<u>Concentrates:</u>					
1953 Season	124,615	2728.00	2276.92	45.64	54.73
1952 Season	59,507	2299.50	-	25.88	-
<u>Plant Operating Time:</u>					
1953 Season	83.46%				
1952 Season	72.04%				

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8. BENEFICIATION: (Con't)f. Hourly Operating Rates: Monthly

<u>Month</u>	<u>Pit Crude to Stockpile</u>	<u>Stockpile to Plant</u>	<u>Heavy Media Feed</u>	<u>Spiral Feed</u>	<u>Concentrates</u>
April - May	174.38	112.75	73.39	32.61	38.13
June	166.61	135.05	94.77	33.33	45.14
July	173.28	122.79	86.06	29.36	40.73
August	173.27	121.72	89.00	26.63	45.03
September	228.84	152.06	124.91	25.63	61.18
<u>Tons Per Hour Net</u>					
April - May	280.08	151.72	98.75	44.69	51.30
June	255.62	156.11	109.55	40.63	52.18
July	297.05	135.06	94.66	32.76	44.81
August	316.41	151.76	110.96	33.33	56.14
September	344.80	174.71	143.52	29.45	70.29

g. Monthly Plant Delays:

<u>Month</u>	<u>Hours</u>		<u>Percent of Season Delays</u>		<u>Percent of Season Working Hours</u>	
	<u>1953</u>	<u>1952</u>	<u>1953</u>	<u>1952</u>	<u>1953</u>	<u>1952</u>
May	162.32	303.67	35.98	47.17	5.95	13.19
June	72.31	13.75	16.03	2.13	2.65	0.59
July	48.72	-	10.80	-	1.79	-
August	101.35	91.98	22.47	14.29	3.72	4.00
September	66.38	72.73	14.72	11.30	2.43	3.16
October	-	161.70	-	25.11	-	7.02
TOTALS	<u>451.08</u>	<u>643.83</u>	<u>100.00</u>	<u>100.00</u>	<u>16.54</u>	<u>27.96</u>

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8. BENEFICIATION: (Con't)h. Surge Pile, Concentrate Stockpile, and Coarse Reject Pile Balance:

	<u>Tons</u>	<u>% Fe</u>	<u>% Si</u>
Crude Ore on Surge Pile 7:00 A.M., April 27, 1953	2,042		
Crude Ore to Surge Pile from pit during 1953 season	348,831	41.31	28.64
Crude Ore from Surge Pile to Plant during 1953 season	349,751	42.19	26.28
Crude Ore on Surge Pile 7:00 A.M., October 1, 1953	1,122	-	-

Concentrate Stockpile Balance

No concentrate on hand or stocked during 1953 season

Heavy Media Reject Pile Balance

	<u>Tons</u>	<u>% Fe</u>	<u>% Si</u>
H.M. Reject Pile 7:00 A.M., April 27, 1953	84,909	33.37	43.52
H.M. Rejects to Pile during 1953 Season	160,378	33.86	40.22
H.M. Reject Pile 7:00 A.M., October 1, 1953	245,287	33.69	41.36

i. Media Loss by Inventory:

	<u>Barrels</u>	<u>Pounds</u>
Ferrosilicon on hand 7:00 A.M., April 27, 1953	325	174,525
Ferrosilicon received during 1953 season	487	246,535
Total on Hand for 1953 Season	812	421,060
Ferrosilicon dumped during 1953 Season	388	206,330
Ferrosilicon on hand 7:00 A.M., October 1, 1953	424	214,730

Ferrosilicon on hand 7:00 A.M., October 1, 1953 (in plant) 35,486

Ferrosilicon Inventory 7:00 A.M., October 1, 1953:

418 Barrels 65 Mesh	211,508 Pounds
6 Barrels 100 Mesh	3,222 Pounds
<u>424 Barrels Total</u>	<u>214,730</u>

	<u># FeSi</u>	<u>Tons</u>	<u>Tons</u>	<u>FeSi Loss</u>	<u>FeSi Loss</u>	<u>Percent</u>
	<u>Dumped</u>	<u>H.M. Feed</u>	<u>H.M. Conc.</u>	<u>#/ton</u>	<u>#/ton</u>	<u>Recovery</u>
				<u>H.M. Feed</u>	<u>H.M. Conc.</u>	
1953 Season	206,330	252,824	92,446	.816	2.232	36.57

j. Monthly Media Loss:

	<u># FeSi</u>	<u>Tons</u>	<u>Tons</u>	<u>FeSi Loss</u>	<u>FeSi Loss</u>	<u>Percent</u>
	<u>Dumped</u>	<u>H.M. Feed</u>	<u>H.M. Conc.</u>	<u>#/ton</u>	<u>#/ton</u>	<u>Recovery</u>
				<u>H.M. Feed</u>	<u>H.M. Conc.</u>	
April - May	48,330	46,382	16,373	1.042	2.952	35.30
June	53,101	50,795	18,454	1.045	2.877	36.33
July	37,910	46,126	14,829	0.822	2.556	32.15
August	34,905	45,567	18,628	0.748	1.830	40.88
September	32,084	63,954	24,162	0.502	1.328	37.78

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8. BENEFICIATION: (Con't)

k. Production Metallurgy:

It became necessary throughout the ore season to have a very close correlation between the pit and mill operation in order to realize maximum grade and recovery from the crude. It was found that the grading of very rich ore on the foot to a leaner material on the hanging side of the pit became more evident at depth as well as did the continual change from a goethitic phase to a limonitic phase along the strike of the formation. By adjusting the feed and gravity in the Heavy Media Plant to correspond to the grade and type of pit crude, production and grade was increased throughout the season. In general, a low feed rate and high specific gravity were necessary in the hanging ore or in limonitic areas and a higher feed rate and low specific gravity were associated with the goethitic areas. Such correlation between pit and mill became a further help when the washing classifier was placed in operation late in June. This installation was able to scalp out a coarse fraction of the spiral feed and send it directly as a concentrate since only a small portion of the -8 +28 mesh material included in the spiral feed was efficiently concentrated by the spirals. By operating this equipment when certain rich portions of the pit were being mined, not only was grade maintained but recovery was increased by approximately 4%.

The grade for the year at 53.39% Fe and 10.23% Sil., although acceptable, did not quite meet expectations. The silica was approximately 0.3% high because of absorbing lean portions of the pit in an effort to become familiar with the concentrating possibilities of all the ore types in the mining area. Upon extending the pit to the west, it was found that the top cut material continued to produce a silicious concentrate despite mill adjustments. This characteristic, which is probably due to weathering, hampered operations throughout the 1952 season.

The crude ore body at depth in the East Pit contained a large amount of calcium carbonate and aluminum oxide, especially along the footwall contact. The concentrate from this material produced a very low iron-silica combination with a 48% Fe and 7% silica often being attained. For this reason the dried iron analysis during 1953 was limited to the 53.39% indicated above. It was also found during the 1953 season that analyses were affected by the sample preparation procedures used previous to the analyzing procedures. No close checks between mill samples and car-top samples were made until additional drying and riffing were included in the procedure. This was necessary because of the size range of the Ohio product which covers from -1" to +150 mesh. Without the proper sample preparation larger proportions of Spiral concentrate were being analyzed, which down-graded the larger product as a whole.

During the 1952 season the greatest source of delay was the hydrocone crusher. This machine was replaced during 1953 by a Symons 4' short-head which performed satisfactorily throughout the season. During 1953 total delay time was reduced by approximately 11.5% and there were no outstanding items such as the crusher breakdowns in 1952. However, outside of usual equipment delays power failures hampered operations continuously during the year due to line difficulties between Ishpeming and Michigamme.

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9. MAINTENANCE, REPAIRS, AND MILL CHANGES:

In an effort to gear the Ohio mill for maximum production, a repair crew was busy throughout all of the idle months of 1953, and numerous changes and installations were also made throughout the operating season. Major changes completed for the ore season included a new 4' shorthead Symons Crusher and motor in the secondary crushing section, a simplicity 3' x 10' triple deck screen to dewater the crusher product and feed the receiving conveyor belt, and an 80' extension added to the coarse reject conveyor. In addition to the latter an entirely new belt of 800 feet was placed on the reject conveyor. Also installed just before mill operations commenced was a new 3" pump for handling water and solids from the secondary crushers and directing the material to the low head screen feeding the heavy media section.

The new washing classifier was lifted into place in June with the entire installation including a 40' conveyor and chutes being completed and tested by the end of June. An air system for controlling ore cars from the pocket was also completed during that month. In August, a trailing conveyor setup was constructed on top of the reject pile to extend the pile to the west. This conveyor was eventually lengthened to a total of 90'. Another change of importance made during the operating season was the increasing in speed of the main conveyor feeding the mill. This change alleviated the clean-up problem existing in the tunnel under the surge pile and thus eliminated additional mill labor. Following the operating season, the crude ore hopper was rebuilt to handle a larger tonnage as well as larger chunks, this size handicap causing many delays during the ore season. An additional sump and drainage system was also constructed on the floor of the mill to facilitate drainage, and a new control room for the crusher operator was built so both primary and secondary section could be observed with a minimum of movement.

The major replacement project during 1953 was the installation of a new crusher mantle and bowl liner during August. Approximately 100,000 long tons of ore were put through the machine at that time and a total adjustment of 6" had been utilized. Because of this rapid wear a small section of the liner and mantle were sent to the Nordberg Company for study.

Numerous other minor changes to the mill circuit were made throughout the year in addition to a complete inspection and general repair of equipment before and after the operating season.

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10. COST OF OPERATION:a. Comparative Mining and Concentrating Costs:a.1. Budget Costs:

<u>Tons</u>	BUDGET		
	Year	Year	Year
	<u>1954</u>	<u>1953</u>	<u>1952</u>
Production - Concentrates (1)	110,000	116,000	211,000
- Crude Ore (2)	305,400	387,000	555,000

COST OF PRODUCTION:

Pit Operating (2)	0.292	0.270	0.437
Total Concentrating (1)	0.928	1.303	1.200
Total Pit and Conc. (2)	0.627	0.660	0.882
Total Pit and Conc. (1)	1.740	2.203	2.320
Loading and Shipping Pocket (1)	0.050	0.070	0.030
Total Pit and Conc. Plant (1)	1.790	2.273	2.350
General Mine Expense (1)	0.511	0.750	0.500
Winter and Idle Expense (1)	0.450	0.500	0.520
Cost of Production (1)	2.751	3.523	3.370
Depr'n Amort., and Taxes (1)	0.910	0.668	1.380
Total Cost on Cars (1)	3.661	4.191	4.750

a.2. Operating Costs:

<u>Tons</u>	<u>Operating Combined</u>		<u>Webster</u>		<u>Portland</u>	
	<u>Webster &amp; Portland</u>		Year	Year	Year	Year
	Year	Year	1953	1952	1953	1952
Production - Concentrates (1)	124,615	59,507	118,481	59,507	6,134	--
- Crude Ore (2)	341,485	196,680	324,685	196,680	16,800	--

COST OF PRODUCTION:

Pit Operating (2)	0.293	0.279	0.292	0.279	0.312	--
Total Concentrating (1)	0.944	1.563	0.937	1.563	1.076	--
Total Pit and Conc. (2)	0.637	0.752	0.634	0.752	0.705	--
Total Pit and Conc. (1)	1.746	2.486	1.736	2.486	1.931	--
Loading and Shipping Pocket (1)	0.053	0.087	0.054	0.087	0.056	--
Total Pit and Conc. Plant (1)	1.799	2.573	1.790	2.573	1.987	--
General Mine Expense (1)	0.574	0.758	0.575	0.758	0.553	--
Winter and Idle Expense (1)	0.870	0.648	0.869	0.648	0.872	--
Cost of Production (1)	3.243	3.978	3.234	3.978	3.412	--
Depr'n Amort., and Taxes (1)	0.850	0.543	0.857	0.543	0.714	--
Total Cost on Cars (1)	4.093	4.521	4.091	4.521	4.126	--

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10. COST OF OPERATION: (Con't)a. Comparative Mining and Concentrating Costs: (Con't)a.3. Combined Winter & Idle With Operating Costs:

Tons	Combined W & I with Combined Optg		Webster W & I Combined With Webster Optg		Portland W & I Combined With Portland Optg	
	Year	Year	Year	Year	Year	Year
	1953	1952	1953	1952	1953	1952
Production - Concentrates (1)	124,615	59,507	118,481	59,507	6,134	--
- Crude Ore (2)	341,485	196,680	324,685	196,680	16,800	--

COST OF PRODUCTION:

Pit Operating (2)	0.293	0.325	0.292	0.325	0.312	--
Total Concentrating (1)	1.438	1.791	1.431	1.791	1.570	--
Total Pit and Conc. (2)	0.817	0.867	0.814	0.867	0.886	--
Total Pit and Conc. (1)	2.239	2.864	2.230	2.864	2.426	--
Loading and Shipping Pocket (1)	0.054	0.087	0.054	0.087	0.056	--
Total Pit and Conc. Plant (1)	2.293	2.951	2.284	2.951	2.482	--
General Mine Expense (1)	0.950	1.027	0.950	1.027	0.930	--
Winter and Idle Expense (1)	0.000	0.000	0.000	0.000	0.000	--
Cost of Production (1)	3.243	3.978	3.234	3.987	3.412	--
Depr'n Amort., and Taxes (1)	0.850	0.543	0.857	0.543	0.714	--
Total Cost on Cars (1)	4.093	4.521	4.091	4.521	4.126	--

a.4. Winter and Idle Expense Costs:

	Combined Winter & Idle Webster & Portland		Winter & Idle Webster		Winter & Idle Portland	
	Year	Year	Year	Year	Year	Year
	1953	1952	1953	1952	1953	1952
<u>COST OF PRODUCTION:</u>						
Pit Operating	-	\$8,961.35	-	\$8,961.35	-	-
Total Concentrating	\$61,505.62	13,585.26	\$58,470.46	13,585.26	\$3,035.16	-
Total Pit & Conc.	61,505.62	22,546.61	58,470.46	22,546.61	3,305.16	-
Total Pit & Conc.	61,505.62	22,546.61	58,470.46	22,546.61	3,035.16	-
Loading & Shipping Pocket	-	-	-	-	-	-
Total Pit & Conc. Plant	\$61,505.62	\$22,546.61	\$58,470.46	\$22,546.61	\$3,035.16	-
General Mine Expense	46,856.44	15,998.52	44,544.18	15,998.52	2,312.26	-
Winter & Idle Expense	-	-	-	-	-	-
Cost of Production	108,362.06	38,545.13	103,014.64	38,545.13	5,347.42	-
Depr'n Amort., & Taxes	-	-	-	-	-	-
Total Cost	\$108,362.06	\$38,545.13	\$103,014.64	\$38,545.13	\$5,347.42	-



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10. COST OF OPERATION: (Con't)a. Comparative Mining and Concentrating Costs: (Con't)a.5. Winter and Idle Monthly Comparison Costs:

	Year 1953			Year 1952		
	<u>Labor</u>	<u>Supplies</u>	<u>Total</u>	<u>Labor</u>	<u>Supplies</u>	<u>Total</u>
January	\$5,430.02	\$4,857.53	\$10,287.55	-	-	-
February	5,119.00	3,876.57	8,995.57	-	-	-
March	6,658.30	11,414.37	17,982.67	-	-	-
April	21,153.12	9,131.41	30,284.53	\$2,951.38	\$854.91	\$3,806.29
May	-	-	-	-	-	-
June	-	-	-	-	-	-
July	-	-	-	6,271.99	657.72	6,929.71
August	-	-	-	1,116.75	254.56	1,371.31
September	-	-	-	-	-	-
October	10,943.31	4,695.86	15,639.17	-	-	-
November	7,440.64	4,233.72	11,674.36	7,768.43	9,228.39	16,996.82
December	<u>9,658.60</u>	<u>3,839.61</u>	<u>13,498.21</u>	<u>7,124.32</u>	<u>2,316.68</u>	<u>9,441.00</u>
GRAND TOTAL	\$66,312.99	\$42,049.07	\$108,362.06	\$25,232.87	\$13,312.26	\$38,545.13

b. Cost Comments:

The 1953 cost of production and total cost on cars at \$3.243 per ton and \$4.093 per ton, respectively, remained within the budget estimate of \$3.523 and \$4.191. The 1953 cost also showed a marked decrease from those realized in 1952 that reached \$3.978 for operating and \$4.521 as a total. Although within the budget, the 1953 expenditures still do not reflect the true cost picture at the Ohio. Since the 1953 season was still part of the break-in period of the mill, numerous expenditures were necessary as a result of testing and changing the mill operation. Also the construction of such items as an additional warehouse and oil house added to the operating costs. It must also be stated that the cost of installing the major items previously described such as the new crusher and reject conveyor extension was charged to the winter and idle account and therefore was completely absorbed in the 1953 season. This along with the other mill changes increased the winter and idle cost to \$0.87 per ton for 1953 which was \$0.37 above the estimate. Decreased mining and milling costs kept the overall budget figures accurate. Costs should not only materially decrease in the future because of the completion of these necessary mill changes in 1953, but also because the building and road changes completed will enable the mine to operate in the future with approximately a 10% decrease in labor force. Similarly, there will be a notable decrease in charges for engineering, geological and metallurgical services in future years. Assuming a reasonable tonnage will be produced each year, it is anticipated that operating costs at the Ohio can now be maintained on a very reasonable level throughout the life of the mine.

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11. EXPLORATION AND FUTURE EXPLORATION:

A diamond drill program was initiated in the South Michigamme region during 1953 in an effort to increase reserves and also to better outline the contacts of the presently known orebodies. Within the year, 4 holes were drilled in the Norwood Lease, 1 hole in the Webster, and 4 holes in the Portland. Four diamond drill holes were also completed in the Imperial Lease, an old underground mining area directly east of the Webster Pit. Total footage for the year was 1,291. In addition 50 churn drill holes were also put down for exploration purposes, of which 21 were in the Webster Lease, 20 were in the Portland Lease, 9 were in the Norwood Lease and 2 were completed in the Imperial.

Because of this drilling, reserves were increased and valuable information was compiled, particularly from the holes in the Norwood, Portland and Webster Leases. However, to date the Imperial exploration has not proven encouraging although the old mine maps of the area indicate a tonnage of direct shipping limonitic ore remaining in old shaft pillars. These pillars will be explored during 1954.

An electromagnetic induction survey was made during the fall in the Imperial, Webster, Norwood, and Titan Lease which added to the knowledge concerning contacts throughout the area. The principal immediate use of this information was to have a more accurate stripping outline, and to aid in outlining the Imperial drilling program.

Field sampling was continued throughout the year with the work being centered in the Norwood-Beaufort Lease. The old drifts exposed in January afforded an opportunity to enter the old workings of the Beaufort Mine which allowed an extensive mapping and sampling program to be undertaken. Outcrops and old dumps were also sampled in the Titan, Imperial, and Portland Leases.

Additional drilling in the area is planned for 1954 to be concentrated in the Titan Lease which is west of the presently proposed Norwood-Beaufort mining area, and in the Imperial Lease which is east of the Webster Pit.

12. TAXES:

a. Valuation for 1954:

For the first time in the company's history the valuation of a property was made by using the annual shipments option of State House Bill number 315, or "Lean Ore Bill". Prior to this year, the alternate method or sales value of plant and equipment was used because it yielded a greater valuation than the shipment method. The average annual production at the Ohio considering the past two years' operation was 92,003 tons and the F.O.B. mine value of this ore was \$10.15 (old range non-Bessemer at 51.50% iron lower lakes), less a \$2.7131 deduction, (for upper lake, rail, freight, tax, etc.) giving a F.O.B. mine value of \$7.4369 per ton. Calculating as stated in the Bill which is 2% of the F.O.B. mine value of the ore multiplied by the total product shipped and using the local tax rate of \$34.01 per \$1,000, a valuation of \$402,352 was obtained. This was rounded out by the Tax Commission to \$405,000. Last year the valuation of this property as calculated by the "sales value" method, was \$390,000.

b. Detail of Valuation and Taxes:

	<u>1951</u>	<u>1952</u>	<u>1953</u>	<u>1954</u>
Value	\$17,200	\$370,000	\$391,350*	\$405,000
Taxes	\$715.51	\$14,652.78	\$13,438.97	-

\* A total of \$1,350 was added to take 1953 valuation following the negotiation for the Titan Lease.

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13. ACCIDENT AND PERSONAL INJURY:

One compensable accident occurred during the year when on January 6th Charles Waisanen, shovel oiler, slipped while standing near the shovel, crushing his left foot under the track. The rear of the shovel which was digging in frost material, raised momentarily as Waisanen slipped, allowing the foot to be caught. Because of infection it eventually became necessary to amputate the left foot. Mr. Waisanen returned to work using an artificial foot on July 1, 1953. Total compensation amounted to \$4,585 plus a hospital bill of \$663.24 made a total cost of \$5,248.24.

14. PROPOSED NEW CONSTRUCTION:

An addition to the office, warehouse and dry is proposed for future construction. The crew required during the operating season cannot be handled with present dry facilities as is the case in the office and main warehouse where a crowded condition exists.

15. EQUIPMENT RECEIVED AND PROPOSED NEW EQUIPMENT:

a. Equipment Received During 1953:

- 1 - Classifier 48" x 20'3"
- 1 - Stacker Conveyor #9
- 1 - Conveyor 24" x 50' #8
- 1 - Electric Drill - 3/4"
- 1 - Motorpump - Size 4RVL25
- 1 - Ingersoll Rand Centrifugal Pump - Size 3RVH-40
- 1 - Barrett-Haentjens Pump - Size 3" Type CB
- 1 - Barrett-Haentjens Pump - Size 5" Type CB
- 1 - Pettibone-Milliken Slurry Pump - Size 8"
- 1 - Triple Deck Screen - 3' x 10'
- 1 - Speed Reducer - "Arite" - #3
- 1 - Allis Chalmers Motor - Size 150 H.P.
- 1 - Allis Chalmers Motor - Size 50 H.P.
- 1 - Allis Chalmers Motor Reducer - Size 40 H.P.
- 1 - Allis Chalmers Motor - Size 10 H.P.
- 1 - Allis Chalmers Motor - Size 7½ H.P.
- 2 - Allis Chalmers Motor - Size 5 H.P.
- 1 - Allis Chalmers Motor - Size 25 H.P.
- 2 - Transformer - 1.5 KVA
- 1 - International Truck - 4 Ton (Used)
- 1 - Hi-Pressure Steam Cleaner
- 1 - Thor Grinder - EN62 - 6"
- 1 - Barrett-Haentjens "P" Pump
- 1 - Pump - Jaeger Portable
- 1 - Vulcanizer - Rubber Belt
- 1 - Crusher 4' Cone, Symons
- 3 - Transformers - 25KVA

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15. EQUIPMENT RECEIVED AND PROPOSED NEW EQUIPMENT: (Con't)

b. Proposed New Equipment:

- 1 - Sample Preparation Unit
- 1 - Belt Vulcanizing Unit
- 1 - Crane
- 1 - Gasoline Water Pump (Pit)

16. NATIONALITY REPORT:

Nationality	American Born			Foreign Born			Total		
	<u>1951</u>	<u>1952</u>	<u>1953</u>	<u>1951</u>	<u>1952</u>	<u>1953</u>	<u>1951</u>	<u>1952</u>	<u>1953</u>
French - German	3	2	2	-	-	-	3	2	2
Irish	3	1	2	-	-	-	3	1	2
English	3	1	1	-	-	-	3	1	1
Polish	1	-	-	-	-	-	1	-	-
Swedish	3	3	2	1	-	1	4	3	3
Swedish - French	1	1	1	-	-	-	1	1	1
Norwegian	1	1	1	-	-	-	1	1	1
French	5	3	3	-	-	-	5	3	3
Finnish	28	28	35	3	3	3	31	31	38
English - French	1	1	2	-	-	-	1	1	2
Irish - French	1	-	-	-	-	-	1	-	-
English - Finnish	1	1	-	-	-	-	1	1	-
German - Dutch - Swedish	1	1	-	-	-	-	1	1	-
Croatian	1	1	1	-	-	-	1	1	1
German - Swedish	-	1	1	-	-	-	-	1	1
TOTAL	52	45	51	4	3	4	56	48	55

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GENERAL

The year 1953 has been, in a large degree, a period of planning, purchasing, preparation. Plans and specifications for major phases of the project were drawn up and submitted for bids, both on the basis of a single contractor on the entire job and on the basis of several contractors (mostly local) working on their respective specialties. A tabulation of the bids indicated that a saving up to \$500,000 was possible by having several contractors do the job with Cleveland-Cliffs Iron Company acting in effect as the general contractor. Accordingly, this procedure was adopted. An E&A for the project, exclusive of pelletizing plant, was drawn up and approved.

Nearly all of the major items of equipment for the crushing plants and mill have been placed on order during the year.

Service facilities, including an access road, railroad and potable water have been brought into the area. Lands have been cleared in the vicinity of the plant site and on the south end of the pit.

Negotiations and surveys were carried on during the year to determine the location of a suitable townsite. An area south of Republic was tentatively selected.

Much of the heavy excavation has been completed and pouring of concrete for footings is well under way.

In general, progress during the year has been good.

Following is a summary of expenditures that have been made during 1953. Except for the amounts shown under "Pelletizing", these expenditures have been made under E&A CC-491.

A. General Expense		\$ 56,453.63
B. General Surface		54,109.45
C. Shop, Office & Dry Building		328,866.01
D. Concentrating Plant		284,276.05
a. Crushing Section	230,385.12	
b. Concentrator Section	53,872.81	
c. Stocking & Shipping Section	13.62	
d. Reagent Storage	<u>4.50</u>	
E. Power Distribution		1,282.18
*F. Pelletizing Plant		81,058.14
G. Mining Equipment		1,564.37
H. Water Supply		-
I. Tailings Disposal		<u>-</u>
	Total	\$807,609.83

\*A new E&A will be prepared to cover the pelletizing plant. Charges accumulated to date are shown under "F", including the cost of preliminary engineering, research, equipment for a pilot pelletizing plant, etc.

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GENERAL (CONT'D.)

Following is a summary of the contractors that have been selected to date:

<u>Project</u>	<u>Area</u>	<u>Company</u>	<u>Amount*</u>	<u>Started</u>	<u>Com- pleted</u>
Excavation	Primary Crusher and Mill	A. Lindberg & Sons, Inc.	\$ 76,681.90	12/15/52	No
Building	Shop, Office and Dry	Proksch Const. Company	392,019.00	5/8/53	No
Excavation, Concrete & Backfill	Crushers and Mill	Proksch Const. Company	348,550.00	10/15/53	No
Furnish & erect Structural Steel	Crushers and Mill	Milwaukee Bridge Co.	645,382.20	No	No
Mechanical	Crushers and Mill	Cloverland Cont. Co.	204,874.00	No	No
Entrance Road	M-95 to Mine	Bacco Const. Co.	23,579.80	8/10/53	10/22/53
Potable Water Line	Village Pump to Mine	Joseph Hamel	4,949.84	9/22/53	11/3/53
Clearing Brush	Plant & Mine Areas	A. C. Carlson	5,850.00	10/6/53	11/14/53
Roofing, flashing & Insulation	Crushers & Mill	Arrowhead Steel Bldgs., Inc.	175,430.00	No	No
Install storm & Sanitary Sewer	Plant area	Proksch Const. Company	16,823.00	12/1/53	No
Electrical	Crushers & Mill	Cloverland Cont. Company	296,906.00	No	No

\*The amounts shown are not final except in the case of contracts that have been completed.

Since this project is at the stage where the work is closely related to the E&A statement, this report will follow the E&A framework. For further clarification, a surface map of the general area is included.

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A. GENERAL EXPENSE

One and two engineers with crews have worked on the project during the year. Base lines and bench marks have been established and the various building column lines located. Much of the area has been profiled and mapped. Considerable time has been required on construction control as well as on road, dike and pipe line surveys. In the pit area, surface profiles were run at 100 foot intervals and the surface geology mapped. This profiling is about 50% complete.

B. GENERAL SURFACE

The Bacco Construction Company completed the 36' wide, gravel surfaced access road from Highway M-95 to the plant site on October 22nd.

Brush was cleared by A. C. Carlson from the pelletizing plant area, south and west of the crushing plant and from the south end of the pit.

An 8" transite potable water line was installed by J. Hamel from the Republic village pump station to the plant site. Included were two fire plugs for fire protection during the construction phase of the project.

The Proksch Construction Company was given the contract for installing the storm and sanitary sewer system south of the office-shop building, including sewer lines, manholes, septic tank, dosing chamber and drain field. This work got under way December 1st and was 65% complete at the end of the year.

Some miscellaneous rock work and excavation was done by A. Lindberg and Sons, Inc. in the vicinity of the secondary crusher building and in the ditch extending from the drain field area to the railroad culvert.

C. SHOP-OFFICE-DRY BUILDING

The Proksch Construction Company started work on the shop-office-dry building on May 8th and by the end of the year, excavation, concrete and back-filling were essentially complete; plumbing and wiring in the basement area were complete; boilers were installed; doors, windows and masonry in the basement were installed and steel erection was about 95% complete. Steel delivery on the building slipped from August 15th to early December, thus delaying the project. Unless further delays develop, it still looks as though the building can be completed by the end of April, 1954.

D. CONCENTRATING PLANT

On October 13th, A. Lindberg and Sons, Inc. completed the excavation of the primary crusher pit and two days later Proksch Construction Company moved in with their equipment.

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D. CONCENTRATING PLANT (CONT'D.)

At the end of the year, Proksch had placed a total of 616 yards of concrete, completing 35% of the foundation work. The crusher piers and walls were poured to the top of the second floor slab, or 12 feet above the bottom floor level. Also included was the concrete collar for the first 23 feet of conveyor tunnel. Approximately 45 feet of a total length of 330 feet of conveyor tunnel remains to be enlarged and brought to grade before the Lindberg excavation contract is completed.

Rough excavation of the secondary-tertiary crushing plant and of the mill site was completed under the Lindberg contract. On November 16th, Proksch started excavating for the four Hardinge mill foundations. At the end of the year, the base leveling pours for these mills were in for a total of 98 yards of concrete and the forms for No. 2 Rod Mill were completed. Late in December, Proksch started excavating for building and machinery foundations at the secondary-tertiary crushing plant site.

Engineering by Abe W. Mathews Engineering Company and Ralph Boeck, Consulting Engineer, continued throughout the year. By the end of December, the primary crusher concrete design was complete and the steel design 92% complete. The mill building concrete design was approximately 45% complete and steel design 90% complete. Except for the design of electrical installations and certain miscellaneous items, engineering should be very nearly completed in March, 1954.

E. POWER DISTRIBUTION

In August, Cliffs Power and Light completed installation of a power line to the site and provided facilities for lighting and other light loads. In November, two 625 KVA transformers were installed to step down 30,000 volts to 2400 volts. These temporary facilities will provide all necessary power during the construction phase of the project.

F. PELLETIZING

Arrangements have been made with Swindell-Dressler Corporation of Pittsburgh for a preliminary design and specifications for an agglomerating plant. Our own engineers worked out the flowsheet and selected much of the equipment. They have also been working closely with Swindell-Dressler Corporation in the layout of a suitable plant.

In the field, the site selected for the pelletizing plant has been cleared and grubbed and testing for ledge is currently under way. For the latter work, a backhoe and a 27-T churn drill have been used. The location of ledge has been found to be erratic, but because of poor soil conditions, it is desirable to bring all major foundations to ledge.



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G. MINING EQUIPMENT

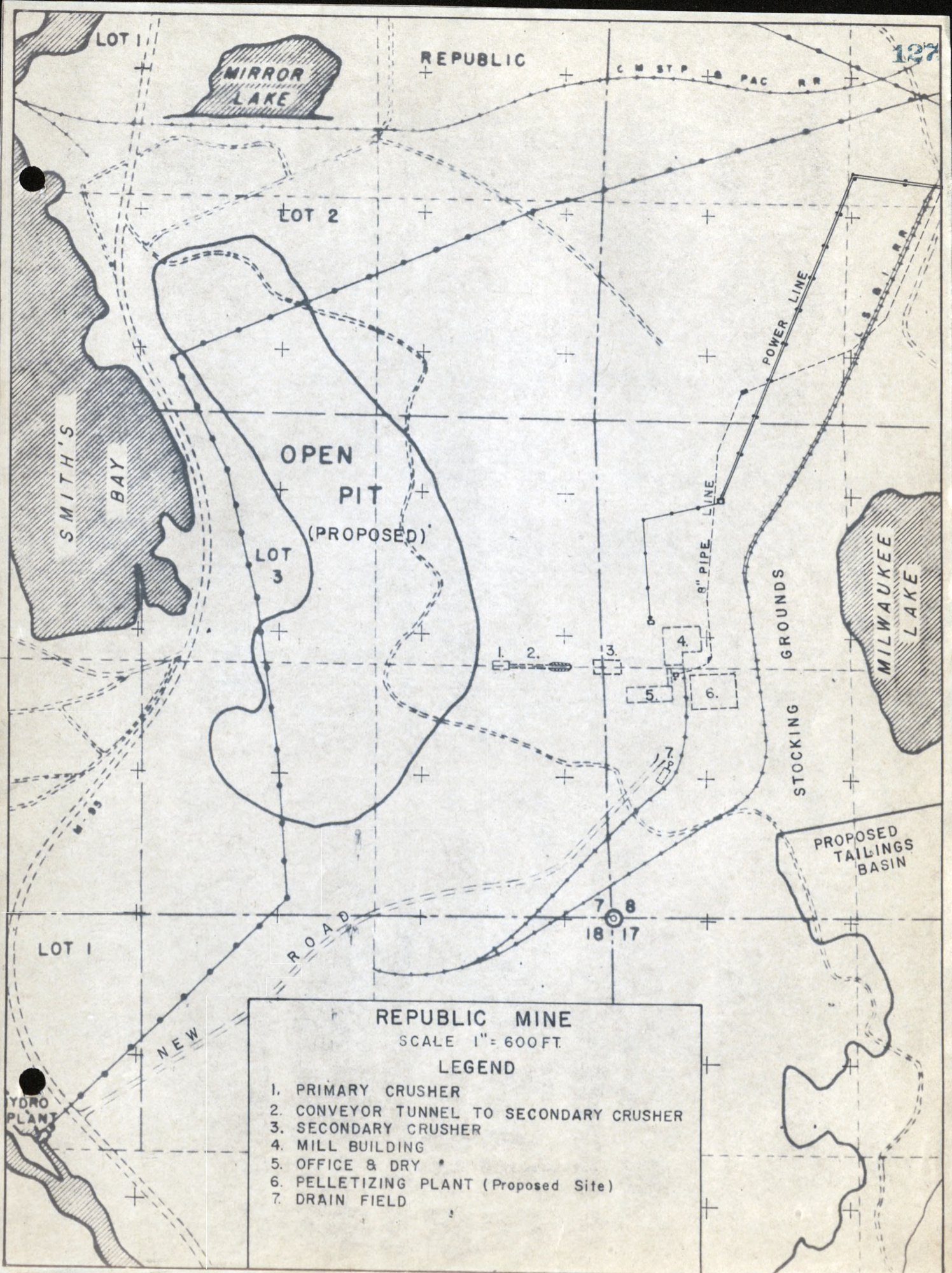
A Bucyrus-Erie 54-B Shovel has been ordered for delivery in April, 1954. A decision was made to use 34-Ton Euclid trucks on a four year rental basis. Five units have been ordered for delivery in May, 1954.

H. WATER SUPPLY

The site for the pump station on Michigamme River was selected and a pipe line survey was started in December. Proposals have been received on the 150,000 gallon elevated water tank for which an order will be placed immediately.

I. TAILINGS DISPOSAL

Considerable engineering time was required on the tailings area. In general, dike line locations have been established, property lines located and profiles of the dike areas are well under way. Aerial photographs have been helpful in this work. It looks as though somewhat less dike work will be necessary than was expected on the basis of original surveys.



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LOT 1

MIRROR LAKE

C. M. & ST. P. & PAC. R.R.

LOT 2

POWER LINE

SMITH'S BAY

OPEN PIT (PROPOSED)

LOT 3

8" PIPE LINE

STOCKING GROUNDS

MILWAUKEE LAKE

1. 2. 3. 4. 5. 6.

STOCKING GROUNDS

PROPOSED TAILINGS BASIN

LOT 1

NEW ROAD

7 8  
18 17

REPUBLIC MINE

SCALE 1" = 600 FT.

LEGEND

- 1. PRIMARY CRUSHER
- 2. CONVEYOR TUNNEL TO SECONDARY CRUSHER
- 3. SECONDARY CRUSHER
- 4. MILL BUILDING
- 5. OFFICE & DRY
- 6. PELLETIZING PLANT (Proposed Site)
- 7. DRAIN FIELD

YDRO PLANT

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1. GENERAL:

There was no activity at the Tilden until March when a crew was organized to initiate a churn drilling program in anticipation of starting a regular production schedule in May. This drilling was completed according to schedule and production of Tilden ore continued from May 4th through August 4th. The total product realized during this period amounted to 178,658 tons including 138,013 tons of Tilden Silica and 40,645 tons of Tilden Low Phos.

Following the termination of the operating season on August 4th, general repairs to the crushing plant and shovels were started and all jobs were completed by December. On January 1, 1954 only a three man crew sharpening churn drill bits for the Humboldt and Republic mines was assigned to the Tilden.

2. PRODUCTION, SHIPMENTS AND INVENTORIES:

a. Production by Grades:

	<u>1953</u>	<u>1952</u>	<u>1951</u>	<u>1950</u>
Tilden Silica	138,013	-0-	86,747	72,955
Tilden Low Phos	<u>40,645</u>	-0-	<u>16,275</u>	<u>34,510</u>
Total	<u>178,658</u>	-0-	<u>103,022</u>	<u>107,465</u>

b. Shipments: (Gross Tons)

<u>Grade</u>	<u>From Pocket</u>	<u>From Stockpile</u>	<u>Total for Year</u>	<u>Remaining Ore in Stock</u>	
				<u>From Mine Records</u>	<u>From Survey Estimates</u>
Tilden Silica	49,471	34,425	83,896	54,117	69,000
Tilden Low Phos	<u>14,619</u>	<u>4,878</u>	<u>19,497</u>	<u>21,700</u>	<u>21,700</u>
Total	64,090	39,303	103,393	75,817	90,700
Total 1952	-0-	80,449	80,449	552	21,000

c. Comparison of Shipments - 6 Year Period: (1948-1954)

<u>Year</u>	<u>Tons Silica</u>	<u>Tons Low Phos</u>	<u>Total Year</u>	<u>Yearly Decrease</u>	<u>Yearly Increase</u>
1948	78,641	43,750	122,391		
1949	69,446	9,373	78,819	43,572	
1950	91,510	23,926	115,436		36,617
1951	78,627	9,959	88,586	26,850	
1952	64,590	15,859	80,449	8,137	
1953	83,896	19,497	103,393		22,944

d. Ore Statement, December 31st 1953:

	<u>Tilden Silica</u>	<u>Tilden Low Phos</u>	<u>Total 1953</u>	<u>Total 1952</u>
On Hand January 1st, 1953	-0-	552	552	73,491
Output for Year	137,341	39,609	176,950	-0-
Transfers	572	572	-0-	-0-
Overruns	100	1,608	1,708	7,510
Total	<u>138,013</u>	<u>41,197</u>	<u>179,210</u>	<u>81,001</u>
Shipments	<u>83,896</u>	<u>19,497</u>	<u>103,393</u>	<u>80,449</u>
Balance on Hand	54,117	21,700	75,817	552

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2. PRODUCTION, SHIPMENTS AND INVENTORIES: (Con't)

e. Stockpile Inventories:

<u>Grade</u>	<u>Balance on Hand Dec. 31, 1952</u>	<u>Stocked 1953</u>	<u>Shipped From Stockpile 1953</u>	<u>Balance on Hand Dec. 31, 1953</u>
Tilden Silica	-0-	87,970	33,853	54,117
Tilden Low Phos	552	26,598	5,450	21,700
Total	552	114,568	39,303	75,817

f. Product by Months:

<u>Month</u>	<u>Days Operated</u>	<u>Average Tonnage Per 8 Hour Shift</u>	<u>Total Tons</u>
May	18	1,584	50,805
June	20	1,467	57,226
July	22	1,474	64,862
August	2	1,441	5,765
Total	62	1,501	178,658

g. Distribution of Product by Pits:

	<u>1953</u>	<u>Percent Used In Silica Grade</u>	<u>1951</u>	<u>Percent Used In Silica Grade</u>
West Pit	101,473	74	58,279	67
East Pit	56,291	26	32,591	33
Summit Pit	20,894		12,152	
Total	178,658		103,022	

3. ANALYSIS:

a. Average Mine Analysis on Shipments:

<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>Loss By Ignition</u>	<u>Moisture</u>	<u>Sul</u>
Tilden Silica	39.10	0.035	42.75	0.07	0.73	0.12	0.20	0.23	1.74	0.009
Tilden Low Phos	36.00	0.013	47.02	0.07	0.56	0.02	0.013	0.14	1.50	0.009

b. Average Analysis on Straight Cargoes:

<u>Grade</u>	<u>Iron</u>	<u>Phos</u>	<u>Sil</u>	<u>Sul</u>	<u>Moist</u>
Tilden Silica	38.95	0.038	42.76	0.010	1.78
Tilden Low Phos	36.05	0.014	46.74	0.009	1.50

c. Average Analysis on Total 1953 Production:

	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Sil</u>	<u>Sul</u>
Tilden Silica	138,013	39.49	0.042	41.99	0.010
Tilden Low Phos	40,645	36.39	0.016	46.34	0.010

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3. ANALYSIS: (Con't)d. Analysis of Ore Remaining in Stock:Average (Dried) Analysis

<u>Grade</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Sulphur</u>
Tilden Silica	54,117	39.57	0.037	41.88	0.010
Tilden Low Phos	21,700	36.26	0.017	46.57	0.011
Total	75,817				

Average Natural Analysis

	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Sulphur</u>	<u>Moisture</u>
Tilden Silica	54,117	38.87	0.036	41.13	0.010	1.78
Tilden Low Phos	21,700	35.72	0.017	45.87	0.011	1.50
Total	75,817					

4. ESTIMATE OF ORE RESERVES:a. Summary of Estimate of Ore Reserves:

	<u>Developed</u>	<u>Prospective</u>	<u>Total Tons</u>
Ore Reserves as of January 1, 1953	4,636,253	2,735,500	7,371,753
Less Production January 1, thru December 31, 1953	178,658		178,658
Ore Reserves as of December 31, 1953	4,457,595	2,735,500	7,193,095

b. Expected Average Natural Analysis of Ore Reserves:

	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Sil</u>	<u>Mang</u>	<u>Sulphur</u>	<u>Moisture</u>
Tilden Developed	4,457,595	37.94	.028	43.51	0.090	0.009	1.690
Tilden Prospective	2,735,500	36.90	.026	42.90	0.090	0.009	1.650
Total	7,193,095						

c. Developed Ore:1. West Pit - Above Floor at 1430'

Assumption: 13 Cubic Feet Equals one ton	
Total Stripped and Developed as of January 1, 1953	1,312,330 Tons
Mined During 1953	101,473
Total Remaining December 31, 1953	1,210,857 Tons

2. East Pit - Above Floor at 1440'

Assumption: 14 Cubic Feet Equals one ton	
Total Stripped and Developed as of January 1, 1953	2,964,529 Tons
Mined during 1953	56,291
Total Remaining December 31, 1953	2,908,238 Tons

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4. ESTIMATE OF ORE RESERVES: (Con't)c. Developed Ore: (Con't)3. Summit Pit - Above Floor at 1620'

Assumption: 14 Cubic Feet equals one ton

Total Stripped and Developed as of January 1, 1953

359,394 Tons

Mined During 1953

20,894

Total Remaining December 31, 1953

338,500 Tons4. Total Developed Ore as of December 31, 1953

West Pit	1,210,857
East Pit	2,908,238
Summit Pit	<u>338,500</u>
Total All Pits	4,457,595

Broken ore in pits is included in the above reserves.

5. Estimate of Broken Ore in Pits

	<u>West Pit</u>	<u>East Pit</u>	<u>Summit Pit</u>	<u>Total Tons</u>
December 31, 1953	-0-	6,000	1,000	7,000

d. Total Prospective Ore:1. West Pit

Balance remaining to be stripped in east half of Upper Bench

500,000 Tons

2. East and Summit Pits

Total above 1500' lying north and east of the East Pit

2,235,500 Tons

Total Prospective Ore as of December 31, 1953

2,735,500 Tons

e. Estimated Analysis of Reserves:

	<u>Pit</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>Moisture</u>
1.	<u>West Pit</u>										
	Dried	39.17	0.050	41.91	0.09	0.90	0.20	0.22	0.009	0.24	-
	Natural	38.50	0.049	41.20	0.09	0.88	0.20	0.22	0.009	0.24	1.70
2.	<u>East Pit</u>										
	Dried	37.00	0.020	45.00	0.09	0.54	0.20	0.17	0.009	0.34	-
	Natural	36.50	0.020	44.40	0.09	0.53	0.20	0.17	0.009	0.34	1.34
3.	<u>Summit Pit</u>										
	Dried	36.00	0.015	46.00	0.09	0.54	0.20	0.17	0.009	0.34	-
	Natural	34.50	0.015	45.40	0.09	0.54	0.20	0.17	0.009	0.34	-

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4. ESTIMATE OF ORE RESERVES: (Con't)f. Estimate of Future Production:

Operating Schedule - Three months every two years  
 Production years - 1955, 1957, 1959, 1961, 1963, 1965, 1967, 1969, etc.  
 Product Per Operating Year - 167,000 Tons Tilden Silica  
   (70,400 Ton Per Month)         44,200 Tons Tilden Low Phos  
   211,200 Total Tons

Estimated Shipments Per Year - 1954-1964           83,500 Tons Tilden Silica  
   22,100 Tons Tilden Low Phos  
   105,600 Tons Total

Anticipated Grades:

	<u>Iron</u>	<u>Phos</u>	<u>Silica</u>	<u>Sulphur</u>	<u>Moisture</u>
<u>Tilden Silica</u>					
Dried	39.00	0.040	42.30	0.010	-
Natural	38.30	0.039	41.59	0.010	1.80
<u>Tilden Low Phos</u>					
Dried	36.00	0.015	46.90	0.010	-
Natural	35.50	0.015	46.24	0.010	1.40

It is planned to operate the Tilden at periods when equipment from other open pits would be available, thereby decreasing the need for very large investments for motorized units.

5. LABOR AND WAGES:a. Comments:

Fourteen of the Tilden employees who had worked at the property during the 1951 operating season agreed to return for the 1953 run, making it necessary to hire 37 men to have a two shift operation. Since an adequate supply of labor was not available in this immediate area, a large number of men from Baraga County were employed for the Tilden. Although inexperienced in open pit mining, the crew performed well and labor relations in general were satisfactory throughout the summer.

There was no vacation period during the summer because of the short operating season but eligible men received vacation pay based on 44 hours per week.

7 Men received pay for three weeks  
 2 Men received pay for two weeks  
 1 Man received pay for one week  
 34 Men were ineligible, having worked less than one year

The total amount paid for vacations in 1953 was \$2,543.90.

b. Comparative Statement of Wages and Product:

	<u>1953</u>	<u>1952</u>	<u>1951</u>	<u>1950</u>
Product	178,658	-0-	103,022	107,465
Number of Days	62	250	57	54
Average Number of Men Working	24	8	23	23
Average Hourly Rate	\$2.188	\$1.940	\$1.948	\$1.566
Tons Per Man Per Hour	8.04	-0-	7.136	6.881
Labor Cost Per Ton	\$.270	-0-	\$.273	\$.228
Amount Paid for Labor	\$102,616.19	\$44,782.76	\$28,126.13	\$24,457.37

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5. LABOR AND WAGES: (Con't)c. Annual Statement of Labor:

	Statistical <u>Men</u>	<u>Hours</u>	<u>Amount</u>	<u>Average Rate</u>
<u>Hourly Employees:</u>				
Straight Time	20	40,562	\$75,502.10	\$1.861
Overtime	5	1,246	1,134.49	.910
Afternoon Shift	16 $\frac{3}{4}$	12,185	749.88	.061
Nite Shift	3	2,920	267.84	.092
Holiday Allowance	7	656	1,271.86	1.939
Holiday - Worked, Premium Only	3	136	254.32	1.870
Sub Total	20	40,562	\$79,180.49	\$1.952
Vacation Pay Accrual			2,543.90	
Retro. Pay Adjustment			5,196.56	
Total Hourly Employees	20	40,562	\$86,920.56	\$2.143
<u>Salaried Employees:</u>				
Mine Payroll, Straight Time	1	2,297	\$5,975.60	\$2.601
- - Holiday		8	18.50	2.312
Total Mine Payroll	21	42,859	\$92,915.05	\$2.168
<u>General Payroll:</u>				
Salaries - Straight Time	5 $\frac{1}{4}$	1,659	\$3,998.00	\$2.410
- Holiday		8	18.27	2.283
Labor from Other Mines	1 $\frac{1}{4}$	2,382	5,684.87	2.387
TOTAL LABOR	23	46,900	\$102,616.19	\$2.188
<u>Distributed as Follows:</u>				
Operating Mine	11	22,217 $\frac{1}{2}$	\$48,248.21	\$2.172
Winter and Idle	7	14,477	\$35,145.26	2.428
Other Mines	2 $\frac{1}{2}$	5,109	10,216.48	2.000
Other Accounts	2 $\frac{3}{4}$	5,096 $\frac{1}{2}$	9,006.24	1.767
Total as Above	23	46,900	\$102,616.19	\$2.188

<u>MINING DATA</u>				
<u>Days Mine Operated</u>	<u>Total Man Days Worked</u>	<u>Production</u>	<u>Units Per Man Day</u>	<u>Labor Cost Per Unit</u>
62	2,777	178,658	64.33	0.270

<u>AVERAGE NUMBER OF MEN</u>			
<u>Mine Payroll</u>		<u>General</u>	<u>Total</u>
<u>Hourly</u>	<u>Salaried</u>	<u>Payroll</u>	<u>Total</u>
22	1	1	24

6. GENERAL SURFACE:a. Buildings and Repairs:

Only minor routine repairs were made to office, shops, warehouse and crushing plant during the year. The conveyor section of the crushing plant required the most attention as the large timber supports for the structure were in a deteriorated condition..



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6. GENERAL SURFACE: (Con't)b. Roads, Transmission Lines, Etc:

The parking lot immediately north of the churn drill bit shop was enlarged before the operating season opened. Also, a culvert was installed in the north road leading to the East Pit which alleviated the icy conditions that existed near the office during the spring breakup.

7. OPEN PIT OPERATIONS:a. Stripping:

There were no stripping operations at the Tilden Mine during 1953.

b. Detail of Open Pit Mining:

Churn drilling for blast holes was started late in March in anticipation of opening the pit in May. Actual production was underway on May 4th on a one shift basis and was advanced to a double shift operation on May 13th. Production was terminated on August 4th after running for 125 shifts and producing 178,658 tons of ore. Included in this tonnage was 138,013 tons of Tilden Silica of which 101,473 tons were mined from the lower bench of the West Pit and 36,540 tons were moved from the upper bench of the East Pit. The remainder of the total production or 40,645 tons was the Tilden Low Phosphorus grade of which 20,894 tons were mined from the Summit Pit and 19,751 tons were trucked from the lower bench of the East Pit.

Two major repair jobs became necessary in the crushing plant during the summer, both occurring in June. In the first case a dipper tooth from the West Pit shovel became lodged in the West secondary crusher bending the main shaft, and finally, during the last week of the month the mantle of the east secondary crusher had to be repalced.

Mining operations were hampered throughout the year by the numerous break-downs of the 15 ton Euclid trucks. The East Pit shovel (Marion) also required continual maintenance to keep in operation.

The tables that follow outline the details of churn drilling, truck haulage, and blasting for the 1953 season:

CHURN DRILLING

<u>Month</u>	<u>Drill No.</u>	<u>Location</u>	<u>Shifts</u>	<u>Holes Drilled</u>	<u>Footage Drilled</u>	<u>Avg Depth Per Hole</u>	<u>Feet Per Shift</u>	<u>No. Bits</u>	<u>Feet Per Bit</u>	<u>Cost Per Foot</u>
March	7	East Pit	-	-	36	-	12.1	-	-	\$7.720
March	8	East Pit	-	1	61	-	12.1	-	-	7.720
April	7	East Pit	-	4	249	-	14.23	-	-	5.331
April	8	East Pit	-	3	196	-	13.06	-	-	5.331
May	7	East Pit	5	1	63	63	12.5	7	9	4.243
May	7	West Pit	21	3	172	64	8	35	5	4.243
May	8	East Pit	8	3	93	31	11.5	11	8	4.243
May	8	West Pit	25	7	399	57	16	40	10	4.243
June	7	West Pit	37	5	373	74.5	10	60	6	4.628
June	8	West Pit	28	9	553	61.5	19.8	42	13	4.628

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7. OPEN PIT OPERATIONS: (Con't)b. Detail of Open Pit Mining: (Con't)

<u>TRUCK HAULAGE</u>				
	<u>Month</u>	<u>Low Phos</u>	<u>Tilden Silica</u>	<u>Total Loads</u>
<u>East Pit</u>				
Lower Bench	May	464	-	464
Upper Bench	May	347	372	719
<u>West Pit</u>				
Lower Bench	May	-	1,588	1,588
<u>Summit Pit</u>	May	330	-	330
<u>East Pit</u>				
Lower Bench	June	413	-	413
Upper Bench	June	104	863	967
<u>West Pit</u>				
Lower Bench	June	-	2,199	2,199
<u>East Pit</u>				
Lower Bench	July	56	-	56
Upper Bench	July	56	800	856
<u>West Pit</u>				
Lower Bench	July	-	2,381	2,381
<u>Summit Pit</u>	July	1,075	-	1,075
<u>East Pit</u>				
Upper Bench	August	165	-	165
<u>West Pit</u>				
Lower Bench	August	-	218	218
<b>TOTAL</b>		<u>3,010</u>	<u>8,421</u>	<u>11,431</u>
East Pit		1,605	2,035	3,640
West Pit		-	6,386	6,386
Summit Pit		<u>1,405</u>	-	<u>1,405</u>
<b>TOTAL</b>		<u>3,010</u>	<u>8,421</u>	<u>11,431</u>

<u>PRIMARY BLASTING</u>										
<u>Location</u>	<u>Date</u>	<u>No of Holes</u>	<u>Footage</u>	<u>Lbs Powder</u>	<u>Tons Ore Per Tonnage</u>	<u>Tons Ore Per Lb. Powder</u>	<u>Blast Access</u>	<u>Powder Amount</u>	<u>Total Amount</u>	<u>Cost Per Ton Broken</u>
<u>West Pit</u>										
Lower Bench	4-28-53	13	851	12,800	27,000	2.109	\$166.25	\$2189.80	\$2356.05	\$0.087
Lower Bench	6-9-53	12	766	13,200	24,000	1.833	156.75	2278.80	2435.55	0.101
<u>East Pit</u>										
Upper Bench	6-17-53	12	698	12,550	26,700	2.127	96.25	2183.25	2279.50	0.085
<u>West Pit</u>										
Lower Bench	7-14-53	12	766	12,800	21,500	1.679	69.25	2176.55	2245.80	0.101
<b>TOTAL</b>							\$488.50	\$8828.40	\$7316.90	

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7. OPEN PIT OPERATIONS: (Con't)b. Detail of Open Pit Mining: (Con't)PRIMARY BLASTING (Con't)

	<u>1953</u>	<u>1951</u>	<u>1950</u>
Product	99,200	49,470	86,900
Tons of Ore Per Pound of Powder	1.935	2.29	2.16
Cost Per Ton for Powder	\$.089	\$.0721	\$.0689
Cost Per Ton for Blasting Supplies	\$.0049	\$.0022	\$.0021
Cost Per Ton for All Explosives	\$.0999	\$.0743	\$.0710
Average Price Per Pound for Powder	\$.1722	\$.1652	\$.1491

SECONDARY BLASTING

<u>Material</u>	<u>Quantity</u>	<u>Price</u> <u>Per 100</u>	<u>Amount</u>
60% Hi-Pressure Gelatin 5 x 5	1,861#	\$22.795	\$424.23
60% Gelatin Extra	854#	19.587	167.28
#6 Caps	1,215	1.698	20.64
Fuse	5,000'	0.949	47.45
Regular Primacord	1,500'	3.400	51.00
Plastic Primacord	1,000'	4.350	43.50
<b>TOTAL</b>			<b>\$754.10</b>

	<u>1953</u>	<u>1951</u>	<u>1950</u>
Product	178,658	103,022	107,465
Pounds of Powder Per Ton of Ore	.0152	.0260	.0223
Cost Per Ton for Powder	\$.0033	\$.0054	\$.0045
Cost Per Ton for Fuse and Caps	\$.0009	\$.0007	\$.0006
Cost Per Ton for all Explosives	\$.0042	\$.0061	\$.0051
Avg. Price Per Pound for Powder	\$.2179	\$.2090	\$.2012
<b>Total All Explosives Used at Pit</b>	<b>\$8,071.00</b>	<b>\$4,306.42</b>	<b>\$6,721.89</b>

8. COST OF OPERATIONS:a. Comparative Mining Costs:

	<u>1953</u>	<u>1951</u>	<u>1950</u>
Production	178,658	103,022	107,465
Operating Cost	\$.713	\$.770	\$.732
General Mine Expense	.144	.209	.184
Stocking Ore	.029	.019	.010
Cost of Production	<u>\$.886</u>	<u>\$1.000</u>	<u>\$.926</u>
1952 Winter & Idle Expense Deferred	\$.163	.000	.000
Depreciation - Movable Equipment	.008	.000	.001
- Plant and Equipment	.070	.070	.070
- Motorized Equipment	.014	.007	.006

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8. COST OF OPERATIONS: (Con't)a. Comparative Mining Costs: (Con't)

	<u>1953</u>	<u>1951</u>	<u>1950</u>
Depletion - Original Cost	\$.004	\$.003	\$.003
Amortization of Development	.004	.003	.003
Amortization of Stripping	.020	.020	.020
Taxes	.029	.066	.057
Loading from Stockpile	.017	.008	.004
Total Cost at Mine	\$1.215	\$1.177	\$1.090
Average Daily Product	2,881	1,807	1,990
Tons Per Man Per Day	64.33	57.09	55.05
Number of Days Operated	62	57	54
Shift	2/8	1/8	1/8

b. Cost of Production - Year 1953:

Production - Tons	<u>Operating</u> 178,658	<u>Tilden Operating</u> <u>Combined with Winter &amp; Idle</u> 178,658
<u>Cost of Production:</u>		
Operating Cost	\$0.476	\$0.713
General Mine Expense	0.075	0.144
Stocking Ore	0.030	0.029
Winter and Idle Expense	0.468	0.000
Cost of Production	\$1.049	\$0.886
Depreciation, Amortization and Taxes	0.149	0.149
Loading and Shipping Expense	0.017	0.017
1952 Winter and Idle Expense Deferred	0.000	0.163
Total Cost at Mine	\$1.215	\$1.215

c. Winter and Idle Expense:

<u>Month</u>	<u>Labor</u>	<u>Supplies</u>	<u>1953</u> <u>Total</u>	<u>1952</u> <u>Total</u>
January	\$2,297.98	\$ 491.22	\$2,789.20	\$5,512.46
February	1,468.04	808.65	2,276.69	7,033.05
March	2,565.05	961.17	3,526.22	4,904.20
April	9,731.67	566.20	10,297.87	5,343.11
May	-	-	-	5,636.10
June	-	-	-	3,941.76
July	-	-	-	1,619.74
August	4,026.54	1,300.52	5,327.06	5,684.12
September	4,981.28	3,362.46	8,343.74	8,260.62
October	5,761.33	2,285.05	8,046.38	6,659.86
November	4,824.73	2,057.35	6,882.08	5,884.00
December	4,319.71	4,515.55	8,835.26	4,985.86
TOTAL	\$39,976.33	\$16,348.17	\$56,324.50	\$65,464.88

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8. COST OF OPERATIONS: (Con't)

d. Cost Comments:

The cost of production for 1953 was \$0.886 per ton which can be compared to \$1.00 per ton in 1951 and \$0.926 per ton in 1950. The total cost on cars for the past year was \$1.215 per ton compared to \$1.177 and \$1.090 for 1951 and 1950 respectively. The total cost was increased slightly because of an addition of \$0.163 per ton for 1952 deferred Winter and Idle charges as the Tilden did not operate in 1952.

The low 1953 costs were realized despite the increases in labor because of changes in the usual Tilden operating procedures which added to the efficiency of the mine, and to reduced Winter and Idle charges. The latter was affected although a large repairing schedule in the crushing plant was necessary following the ore season. The reduction of the total men per shift by six compared to the average force at the mine during past seasons, the reduction in operating time of the East Pit which formerly produced 35% of the ore shipped as the Silica grade, and the utilizing of old broken ore piles that represented overrun from previous years' blasts were the major items that added to the overall efficiency of the operation.

It will be possible to continue operating the Tilden at the cost level achieved in 1953 if another truck fleet can be utilized in the future to reduce the delays caused by truck breakdowns.

9. TAXES:

<u>Description</u>	<u>1953</u>		<u>1952</u>	
	<u>Valuation</u>	<u>Taxes</u>	<u>Valuation</u>	<u>Taxes</u>
N $\frac{1}{2}$ of Sec. 26, 47-27 320 A.	\$190,000	\$3,863.80	\$65,000	\$1,319.15
Personal Property, Equipment & Supplies	65,000	1,321.80	225,000	4,566.28
Total Tilden Mine	\$255,000	\$5,185.60	\$290,000	\$5,885.43

10. PERSONAL INJURY:

There were no compensable injuries at the Tilden Mine during 1953.

11. EQUIPMENT AND PROPOSED NEW EQUIPMENT:

a. Equipment Received

- One - Pick-up Truck
- One - Angledozer Blade for TD-6 Tractor

b. Proposed Equipment

There was no equipment proposed for 1954.

12. NATIONALITY REPORT:

The following table outlines the descent of the men associated with the Tilden Mine during 1953:

English	14
Swedish	9
Finnish	18
Irish	2
German	2
Italian	3
French	3
Total	51

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1. GENERAL:

The Athens Mine operated on a 5-day schedule throughout the entire year of 1953. Mining operations were performed by a complete 2-shift crew, with a small hoisting crew on the third shift.

Production from the Athens Mine in 1953 totaled 620,080 tons. This is an increase of 24.7% over the 497,277 tons produced in 1952. Three levels produced ore during the year—6th, 7th, and 10th. Approximately 3/5 of the total came from 10th level and 2/5 from 6th level. Only a small portion, 2767 tons, was produced on 7th level as this area was still in the development stage at the end of the year.

The cost of production for 1953 was \$3.650 per ton as compared to \$3.878 per ton for 1952—a decrease of \$0.228 per ton. Although there was an appreciable increase in the cost of labor and supplies in 1953, it was more than offset by the high production rate, resulting in the lower unit cost per ton. It is noteworthy that the cost of timbering decreased \$0.154 per ton in 1953. This is a result of the change from top slicing to sub-level caving midway in 1952 and the replacement of timber sets by steel sets in areas where it is necessary to maintain support for an extended period.

The high rate of production during 1953 was achieved under anything but ideal mining conditions. By the middle of the year, all the large block cave areas on 10th level were mined out, and mining operations from then on consisted of mostly a cleaning-up process—caving of small areas with limited height and scrambling between the old block caves. To further add to the problem, with the near-depletion of the Athens reserves on 10th level, more production had to be obtained from the Bunker Hill property, where excessive amounts of water were encountered whenever a new area was opened up. That these problems were overcome, resulting in the high production for 1953, is a tribute to the planning and efficiency of the underground supervisory staff.

Main level drifting during the year was confined to two cross-cuts on 10th level and the main line on 7th level. Mining in 1953 was accomplished by sub-level caving and block caving on 6th level and sub-level caving, block caving, and scrambling on 10th level.

Both ore and rock development work increased during the year. The amount of ore development done during the year was 4945 feet while for rock development, the figure was 3450 feet. This compares favorably with 3487 feet of ore development and 3330 feet of rock development in 1952. The increase is due primarily to the fact that less tonnage was available in the newly developed block caves than in previous years, therefore requiring the development of more blocks to meet the production requirements.

As in previous years, the surface buildings and surface area were affected by subsidence. However, since the changeover of surface operations from the Athens Mine to the Negaunee Shaft will be made on January 1, 1954, this situation is no longer critical.

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1. GENERAL: (Cont'd.)

Exploration by diamond drilling during 1953 was confined to the Athens and Bunker Hill properties, with the majority of the drilling being done in the Bunker Hill. The purpose of drilling in the Athens property was to further delineate the shape of the known ore bodies for mining control. In the Bunker Hill, the accelerated drilling program was continued through the first seven months of 1953, but during the last five months it was discontinued and only one machine was used. The exploration added to the existing knowledge of the structure and also increased the proven reserves of the Bunker Hill property.

2. PRODUCTION:

Production by Grades and Months:

Month	Athens	Mitchell	Corbit	Bunker Hill	Total	Rock
January	26,146	17,855		7,584	51,585	2,425
February	29,434	12,367		3,228	45,029	4,015
March	26,241	17,698		8,300	52,239	2,920
April	24,372	15,312		11,348	51,032	3,105
May	15,846	17,802		15,832	49,480	3,895
June	13,335	18,025		18,336	49,696	1,790
July	19,573	17,584		11,646	48,803	1,393
August	22,041	12,741		10,748	45,530	1,080
September	18,820	14,842		15,249	48,911	1,360
October	30,605	7,728		12,971	51,304	1,670
November	22,105	12,245		12,261	46,611	985
December	19,570	17,970		7,275	44,815	465
Total:	268,088	182,169		134,778	585,035	25,103

Stockpile	Athens	Mitchell	Corbit	Bunker Hill	Total	Rock
Overrun	28,342	3,282		3,421	35,045	
Total 1953	296,430	185,451		138,199	620,080	25,103
Total 1952	347,412	96,636	142	53,087	497,277	32,475
Increase		88,815		85,112	122,803	
Decrease	50,982		142			7,372

Shipments:	Pocket	Stockpile	1953 Total	1952 Total
Grades:				
Athens	87,676	187,478	275,154	370,638
Mitchell Lease	104,562	67,860	172,422	91,427
Corbit Lease				3,857
Bunker Hill	93,807	32,384	126,191	45,621
Total	286,045	287,722	573,767	511,543
Total Last Year	228,317	283,226	511,543	
Increase in Shipments	57,728	4,496	62,224	
Decrease " "				

Ore Statement:

	Athens	Mitchell Lease	Corbit Lease	Bunker Hill	1953 Total	1952 Total
On Hand January 1, 1953	32,294	16,983		7,779	57,056	71,322
Output for Year	268,088	182,169		134,778	585,035	489,906

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2. PRODUCTION: (Cont'd.)  
Ore Statement: (Cont'd.)

	<u>Athens</u>	<u>Mitchell Lease</u>	<u>Corbit Lease</u>	<u>Bunker Hill</u>	<u>1953 Total</u>	<u>1952 Total</u>
Stockpile Overrun	28,342	3,282		3,421	35,045	7,371
Total	328,724	202,434		145,978	677,136	568,599
Shipments	275,154	172,422		126,191	573,767	511,543
Balance on Hand	53,570	30,012		19,787	103,369	57,056
Increase in Output		87,368		81,770	95,129	
Decrease in "	74,009					106,455
Increase in Ore on Hand	21,276	13,029		12,008	46,313	
Decrease in Ore on Hand						14,265

Operating Schedule:

<u>Year</u>	<u>Days Per Week Mine Operated</u>
1953	5 Days - Entire Year
1952	6 " - Through July: 5½ days through November 15; and 5 days through December.
1951	6 " - Entire Year
1950	5 " - January through July; 6 days August through December.
1949	6 " - January " June; 5 days July " "

Division of Products by Levels:

	<u>1953</u>		<u>1952</u>	
	<u>Tons</u>	<u>Percent</u>	<u>Tons</u>	<u>Percent</u>
6th Level	250,180	40.3%	163,278	32.8%
7th "	2,767	0.5%		
8th "				
9th "				
10th "	367,133	59.2%	333,999	67.2%
Total	620,080	100.0%	497,277	100.0%

Production Delays:

<u>Date</u>	<u>Hours</u>		<u>Tons Lost</u>
March 11	3	Due to blasting on 8th Level	300
April 8	4½	Repair Shaft	450
June 6	2	Power Failure	200
July 27	3½	Repair Skip Hoist	350
	38	Misc.	3800
Total:	51		5100

3. ANALYSIS:

Average Mine Analysis on Output:

<u>Grade:</u>	<u>1953</u>					<u>1952</u>			
	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Sul.</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>
Athens, Corbit,									
Bunker Hill	434,629	57.78	.117	9.53	.011	400,641	58.63	.108	9.36
Mitchell Lease	185,451	58.26	.122	8.88	.011	96,636	59.50	.118	7.83
Total:	620,080	58.01	.117	9.01	.011	497,277	58.80	.110	9.06



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3. ANALYSIS: (Cont'd.)

Average Analysis of Shipments:

<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>
Athens-Bunker Hill										
& Mitchell	57.80	.128	9.74	.44	3.17	.41	.94	.012	1.62	12.93
<u>Natural</u>	50.33	.111	8.48	.38	2.76	.36	.82	.010	1.41	

Average Analysis of Ore in Stock:

<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>
Athens-Bunker Hill	64,497	57.45	.121	10.62	.45	3.05	.52	1.01	.011	1.60	12.90
Natural		50.04	.105	9.25	.39	2.66	.45	.88	.010	1.39	
Mitchell	26,502	58.47	.137	9.41	.45	3.05	.50	.94	.010	1.60	12.90
Natural		50.93	.119	8.20	.39	2.66	.44	.82	.009	1.39	
Athens at Negaunee	12,370	59.50	.119	8.14	.45	3.05	.40	.90	.011	1.60	12.90
Natural		51.82	.104	7.09	.39	2.66	.35	.78	.010	1.39	

4. ESTIMATE AND ANALYSIS OF ORE RESERVES:

Developed Ore:

In the Athens property, of the total ore reserve, which is based on the figures submitted to the Michigan State Tax Commission, the reserve between the 4th and 10th levels is considered as developed ore. The remaining ore, or that between 10th and 14th levels, is considered as undeveloped ore.

In the Bunker Hill property, the ore reserve above the 10th level is considered developed and that below the 10th level undeveloped.

The ore reserves in the following table are based on figures that were submitted to the Michigan State Tax Commission:

	<u>Athens</u>	<u>Mitchell Lease</u>	<u>Bunker Hill</u>	<u>Total</u>
Ore Reserves - Dec. 31, 1952	1,401,413	294,019	1,696,380	3,391,812
Ore Production - 1953	296,430	185,451	138,199	620,080
Ore Reserves - Dec. 31, 1953	1,483,016	228,258	2,387,328	4,098,602
Tonnage Proved in 1953	378,033	119,690	829,147	1,326,870
4th to 6th Level	175,450	215,658		391,108
6th to 7th Level	12,216	109,353		121,569
7th to 8th Level				
8th to 9th Level	15,386			15,386
9th to 10th Level	365,439		387,680	753,119
10th to 12th Level	1,112,118		1,454,686	2,566,804
12th to 14th Level	121,941		557,931	679,872
14th to 16th Level			10,882	10,882
Total Gross Tons on				
July 31, 1953	1,802,550	325,011	2,411,179	4,538,740
Less August 1953 Production	22,041	12,741	10,748	45,530
Total Gross Tons on August				
31, 1953	1,780,509	312,270	2,400,431	4,493,210
Tonnage Increase as Proven				
by Exploration - August 31,				
1953 to Dec. 31, 1953			309,019	309,019

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4. ESTIMATE AND ANALYSIS OF ORE RESERVES: (Cont'd.)

<u>Developed Ore: (cont'd.)</u>				
	<u>Athens</u>	<u>Mitchell Lease</u>	<u>Bunker Hill</u>	<u>Total</u>
Total on Dec. 31, 1953	1,780,509	312,270	2,709,450	4,802,229
Less Production Aug. 31, 1953				
To December 31, 1953	119,442	52,785	51,177	223,404
Total Gross Tons on Dec. 31, 1953	1,661,067	259,485	2,658,273	4,578,825
Less 10% for Mining Loss & Rock	178,051	31,227	270,945	480,223
Net Tons on Dec. 31, 1953	1,483,016	228,258	2,387,328	4,098,602
Net Tons on Dec. 31, 1952	1,401,413	294,019	1,696,380	3,391,812
Increase	81,603		690,948	706,790
Decrease		65,761		

Expected Average Natural Analysis of Ore Reserves:

The following analyses are based on the figures submitted to the Michigan State Tax Commission:

<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>
51.00	0.10	8.00	0.30	2.75	0.40	0.76	0.012	1.40	13.50

5. LABOR AND WAGES:

Labor Relations:

During 1953, there were four grievances advanced to Step 2, one to Step 3, two to Step 4, and one to arbitration. Two of these are being carried into 1954--one from Step 2 and one from Step 4. Of those in which a decision was made before reaching arbitration, all were won by the Company but one, which was adjusted in Step 2. A compromise was reached on the grievance going to arbitration, giving no particular advantage to either party.

It is apparent from the above that labor relations at the Athens Mine did not show much improvement over the strike year of 1952. Hopes of reaching the mature stage of collective bargaining under the 1952 contract have all but deteriorated in the face of what seems to be a dogged determination on the part of the employees to make an issue of any differences that might arise. The labor force at the Athens is largely controlled by a small nucleus of men who refuse to listen to the reasoning of the Company, however logical. Attempts are being made continually to improve the relations between the Company and the men, but the results to date have not been very gratifying.

Employment:

The average number of statistical employees in 1953 was 344 as compared with 310 in 1952, an increase of 34. Some of the increase resulted from being on a 5-day schedule for the entire year with extra men working on week-ends. Another factor was the mine operating a full year while it was idle approximately 2 months in 1952.

There were 90 separations during 1953, made up as follows: 11 reduction in force, 5 retired, 4 deceased, 19 quit, 45 transferred, 6 discharged and 6 drafted. There were 53 men hired during the year. The large number of transfers was due to the changing of hoisting operations from the Athens to Negaunee Shaft.

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5. LABOR AND WAGES: (Cont'd.)  
Employment: (cont'd.)

Number of Men Beginning of Year	335
Added During Year	53
Separations	<u>90</u>
Total End of Year	298

The following tables give data pertinent to paid vacations and holidays.

Vacations - 1953

	<u>Number of Men</u>	<u>Number of Hours</u>	<u>Amount</u>	<u>Rate Per Hour</u>
One Week	56	2477½	\$ 5205.10	\$2.10
Two Weeks	114	10310¼	24219.04	2.35
Three Weeks	<u>128</u>	<u>16992</u>	<u>38267.69</u>	<u>2.25</u>
Total	298	29779¾	\$67691.83	2.27

Paid Holidays - 1953

	<u>Number of Men</u>	<u>Number of Hours</u>	<u>Amount</u>	<u>Rate Per Hour</u>
New Years Day	295	2360	\$ 4493.16	\$1.90
Memorial Day	294	2352	4701.05	2.00
Fourth of July	259	2059	429.80	2.15
Labor Day	266	2128	4574.30	2.15
Thanksgiving	244	1952	4352.00	2.22
Christmas	<u>238</u>	<u>1899</u>	<u>4179.04</u>	<u>2.20</u>
Total	266	12750	\$26729.35	\$2.10

Statement of Wages:

<u>Average Wages Per Day</u>	<u>1953</u>	<u>1952</u>	<u>Increase</u>	<u>Decrease</u>
Surface	\$ 16.68	\$ 15.20	\$ 1.48	
Underground	<u>19.70</u>	<u>17.20</u>	<u>2.50</u>	
Total	\$ 18.98	\$ 16.80	\$ 2.18	

Average Wages Per Month

Surface	\$352.95	\$366.92		\$13.97
Underground	<u>416.85</u>	<u>415.21</u>	\$ 1.64	
Total	\$401.62	\$405.55		\$12.33

Average Days Worked Per Month

1953 - 21.16  
1952 - 24.14

Tons Per Man Per Day

Surface	32.43	28.59	3.84
Underground	<u>9.89</u>	<u>8.16</u>	<u>1.73</u>
Total	7.58	6.35	1.23

Labor Cost Per Ton

Surface	.514	.535	.021
Underground	<u>1.992</u>	<u>2.114</u>	<u>.122</u>
Total	2.506	2.649	.143

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6. SURFACE:

The surface buildings and surface area continued to show movement and cracking throughout the year. The south wing of the old dry building, which was abandoned two years ago, collapsed, and the rest of the building is badly cracked and distorted. New cracks and bulges developed in the shops buildings, particularly in the western portion where the blacksmith shop is housed. Large cracks were noticed for the first time on the engine house hill. These cracks, which ranged from one to three inches in width, were found on the southwest side of the hill, one of them coming as close as 70 feet from the southwest corner of the engine house. Several times during the year it was necessary to raise the railroad tracks under the loading pocket at the shaft after they had subsided to a point where railroad cars would no longer coast freely on the grade.

A semi-circular, corrugated, metal launder was installed from an area west of the Athens cave to a point beyond the east end of the cave for the purpose of carrying Partridge Creek over the caved area. Flumes located at both ends of the cave disclosed considerable leakage was entering the caved area before the installation of the launder. Although it is too early to tell, it is hoped that the launder will eliminate this leakage and result in less water entering the mining areas.

In order that no unauthorized persons would enter the Athens Mine property, especially the caved area, a wire mesh fence, approximately 5 feet high, was installed completely around the Athens surface area.

The ore was stocked in two piles at the Athens Mine during the year. Ore from the Athens and Bunker Hill properties was stocked from the north steel trestle and ore from the Mitchell Lease from the south steel trestle. The rock was stocked under the wooden trestle extending southwest from the shaft on caving ground. As it accumulated under the trestle, the rock was bulldozed into the cave.

During the year all the Athens' houses were disposed of, with the majority of them being sold to the occupants. No surface real estate was acquired during the year, although future acquisition is contemplated in conjunction with the westward extension of mining.

The mine discharge water is directed eastward from the shaft along the mine service railroad tracks to Queen Street; thence northward to the north side of the D. S. S. & A. Railway; thence eastward and joins the Negaunee Shaft discharge water from where it travels eastward to the Carp River.

7. UNDERGROUND:

Mining and Development:

Mining operations above the 6th level consisted of sub-level caving in the Athens lots and sub-level caving and block caving in the Mitchell lots. Mining of the -485 sub, the first sub-level to make the changeover from top slicing to sub-level caving, was completed during the year. The -500 sub reached its last stages and mining of the -525 sub commenced in the latter part of the year. Since its replacement of top

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7. UNDERGROUND: (Cont'd.)  
Mining and Development: (cont'd.)

slicing in 1951, sub-level caving in these areas has proven highly successful. The block cave area in the Mitchell lots was mined out by 3 circular steel drifts extending both north and south of the transfer over 6th level.

On 7th level, the main level drift was extended southward to make available the ore in the east end of the south ore body between 6th and 7th levels.

Development of a block cave in this area consisting of 3 circular steel drifts began in the latter part of the year, and full-scale production is expected in early 1954.

In the Athens property above 10th level, sub-level caving and block caving in the south ore body and block caving and scrambling in the north ore body constituted the mining operations during 1953. In the south ore body, 2 conventional-type block caves were developed and production commenced in one of these during 1953. A conventional-type block can be described as one having a transfer drift over the level connected by raises to 2 timbered grizzly drifts 25 feet above. The other type of block cave, one having circular steel drifts directly over the level, might be termed a modified block cave. Although more development is required by the conventional-type block cave, it is used in areas with large tonnages because of its faster rate of production.

In the north ore body above 10th level, which lies wholly in the Athens property, mining of the last conventional-type block was completed. Because of the limited height of the remaining reserves in this area, it was developed by circular steel drifts or the modified block system. Mining of this area will commence in early 1954. Scrambling between the pillars left by the old block caves continued satisfactorily during 1953. This will serve to cut off the ore body on the -985 sub, thus insuring a better recovery from the block caving areas directly below on 12th level.

In the Bunker Hill property, main level drifting consisted of the extension of 2 cross-cuts. One of these, 1600 cross-cut, was advanced into the Arctic 4.57 Acre Parcel for the purpose of exploring the ore cut by Bunker Hill diamond-drill hole No. 12. Mining in the Bunker Hill was carried on exclusively by block caving. Mining of a modified type of block cave, which utilized 4 circular steel drifts, over 1500 cross-cut was completed during the year. This block was the first at the Athens Mine in which circular steel drifts were used, and being in an exceptionally wet and heavy area, it took considerable weight causing the cessation of caving before full recovery was realized. However, the experience gained in this block proved to be a valuable asset in the later development and mining of circular steel drifts throughout the mine. A block of the conventional-type was also developed over 1500 cross-cut and mined during the year. Development of circular steel drifts to the east and west of 1600 and 1700 cross-cuts proceeded during the year, with mining of the eastern portion over 1600 cross-cut being completed.

An exploration drift was driven to an area west of the Foley Dike to diamond drill both the northwest and southwest quadrants formed by the crossing of the Athens Main Dike and the Foley Dike.

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7. UNDERGROUND: (Cont'd.)

Mining and Development: (Cont'd.)

The following is a resume of the main level drifting done during 1953:

<u>Level</u>	<u>Ore Drift</u>	<u>Rock Drift</u>	<u>Total</u>
7th Level	43	623	666
10th Level		322	322
Total	43	945	988

Exploration:

Athens:

Diamond drilling exploration for 1953 was centered in three areas: above and south of the old 1030 drift in the south ore body, in the north ore body along the 1600 W. above and below the 10th level, and in the area immediately east of the 1500 cross-cut from the -990 sub-level. The purpose of the drilling exploration was to further delineate the shape of the known ore bodies for mining control. Four holes were drilled and these holes proved up a greater tonnage of ore than had been anticipated.

Routine mapping of the working places did not disclose any major changes in the Athens structure. In the table immediately below are shown the total footage and the amount of first-class ore cut in each hole.

<u>U. H. Number</u>	<u>Amount of 1st-Class Ore</u>	<u>Footage Drilled</u>
50	5	166
51	180	286
52	125	285
53	40	175
Total	350'	912'

Hole #50 was drilled from the old 1030 south drift with an inclination of +20°, course S. 7° W., from S. 3342 and 1326 W. This hole was drilled to test for the possible thickness of ore above the sub-level. A considerable amount of second-class ore was cut.

In the north ore body, holes #51 and #52 were drilled from the top-timber transfer. Hole #51 was drilled with an inclination of -75° and a course of N. 8° W. from S. 3149 and 1581 W. The hole was drilled to test for the thickness of ore and the position of the north footwall at 12th level elevation. Drilling proved the footwall to be slightly north of the anticipated position.

Hole #52 was drilled to test for the height of ore above the proposed transfer. The hole was drilled with an inclination of +25°, course N. 3° E. from S. 3141 and 1581 W.

In the south ore body, hole #53 was drilled with an inclination of +29°, course S. 27°06' E. from S. 3493 and 1857 W. The purpose of this hole was to determine the position of the intrusive which cuts the area and also to locate the south footwall for mining layout purposes.

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7. UNDERGROUND: (Cont'd.)  
Exploration: (cont'd.)  
Bunker Hill:

The accelerated exploration program which had been initiated during 1952 was continued through the first seven months of 1953. After this period only one machine was used. The major exploration activity was conducted on four north-south sections: 2100 W., 2200 W., 2400 W., and 2800 W. In all, sixteen holes were drilled of which twelve explored the complex area between the east boundary and the 2400 W. The other four holes explored to the west of the 2400 co-ordinate. The exploration added to the existing knowledge of the structure and also increased the proven reserves of the Bunker Hill property.

In many instances the holes cut fault zones and a considerable amount of time and effort was expended in drilling through these zones. The following table shows the first-class ore cut and the total footage drilled:

<u>Hole Number</u>	<u>First-Class Ore</u>	<u>Footage Drilled</u>
11	47	268 Hole 11 was re-entered
19		616
20	54	259
21	566	735
22		552
23	70	468
24	53	304
25	338	595
26		60 Abandoned in fault zone
27		332
28		75 Abandoned in fault zone
29	45	495
30	104	345
31	318	450
32	31	31 Unfinished
33	10	70 "
Total	<u>1636</u>	<u>5655</u>

2100 Section:

Holes 11, 22, 26, and 28 were drilled and were intended to explore the fault area in the north ore body. Hole #11, a flat hole, was extended to the footwall to test for ore and possible displacement. Forty-seven feet of first-class ore was cut and a minor displacement of the footwall was indicated. Hole #22 was drilled to test for ore at depth. The drilling was unsuccessful because the hole stayed in intrusive. Hole #26 and #28 were stopped because they were unable to penetrate the fault zone.

2200 Section:

Holes 24, 27, and 30 were drilled along the 2200 W. Section. Holes 24 and 27 were drilled as up-holes in the south ore structure to prove the suspected position of the flat-lying intrusive. A minor amount of ore lies above the intrusive.

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7. UNDERGROUND: (Cont'd.)  
Exploration: (cont'd.)  
2200 Section: (cont'd.)

Hole #30 was drilled to explore for ore west of the northeast-southwest fault. This hole shows that the enrichment is less to the west of the fault.

2400 Section:

On the 2400 section, holes 20, 25, and 29 were drilled. Holes 20 and 25 were drilled in the south ore body to test for height and depth. Drilling to depth demonstrated the overthrust nature of the NW-SE fault and also proved ore to a considerable depth. Hole #29 indicated that a favorable ore-bearing structure lies above the 10th level at a considerable distance north of the Athens Main Dike.

Holes 19, 21, and 23 were drilled westward from the 2400 W. in an effort to locate the Foley Dike. The drilling was successful in that respect, and hole #21 cut a considerable amount of ore at 10th level elevation.

2800 W:

Holes 31, 32, and 33 were being drilled in the south ore structure. The indications are that this area is complicated by a flat-lying intrusive.

Statement of Timber Used:

	<u>Lineal Feet</u>	<u>Av. Price Per Foot</u>	<u>Amount-1953</u>	<u>Amount-1952</u>
Gribbing	60,209	.09882	\$ 5,950.44	\$ 3,109.52
Stalls	72,778	.38098	27,727.22	26,259.85
Lagging	747,306	.02135	15,956.40	15,291.04
Poles	346,654	.03576	12,398.82	12,167.80
Steel H-Beams	23,697	1.1561	27,510.25	12,966.46
Circ. Steel Sets	559	50.891	28,448.15	
			<u>\$117,991.28</u>	<u>\$69,794.67</u>

Total Cost of Timber, Lagging, Poles, Etc:

<u>Year</u>	<u>Amount</u>	<u>Per Ton</u>
1953	\$117,991.28	\$ .1903
1952	69,794.67	.1404
1951	69,080.92	.1097
1950	64,244.24	.1050
1949	68,774.33	.1250
1948	79,243.23	.1564
1947	78,082.59	.1537
1946	53,734.65	.1463
1945	72,844.22	.1661
1944	77,935.27	.1850



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7. UNDERGROUND DEVELOPMENT: (Cont'd.)Explosives:

STATEMENT OF EXPLOSIVES USED DURING 1953  
ORE DEVELOPMENT & STOPING

Kind	Quantity	Average Price-Cwt.	Amount	
			1953	1952
No. 2-X Hercomite Powder	163,125 lb.	\$16.56	\$ 27,011.86	\$ 15,108.79
No. 2 Hercomite Powder				479.69
No. 1-X Gelamite Powder	27,550 "	17.38	4,787.31	4,064.35
No. 2 Gelamite Powder	8,500 "	17.29	1,469.60	966.15
No. 1 Gelamite Powder				212.88
60% H.Pr. Gelatin 5x5#	500 "	22.50	112.50	5,727.00
80% Gelatin, Extra	500 "	21.15	105.75	163.20
60% Gelatin, Extra	2,250 "	19.90	447.75	909.63
60% H.Pr. Gelatin 4"x2#	7,050 "	23.76	1,674.75	
Total Powder 1953	209,475	17.00	\$ 35,609.52	
Total Powder 1952	157,550	17.54		\$ 27,631.69
Total Fuse, Caps, Etc.			\$ 17,267.88	\$ 14,946.55
TOTAL ALL EXPLOSIVES			\$ 52,877.40	\$ 42,578.24
PRODUCT			620,080	497,277
Pounds Powder Per Ton of Ore			.2910	.3168
Tons of Ore Per Pound of Powder			3.4362	3.1563
Cost Per Ton for Powder			\$ .0584	\$ .0556
Cost Per Ton for Fuse, Cap, Etc.			.02896	.0301
Cost Per Ton for All Explosives			.0874	.0857

ROCK DEVELOPMENT

No. 2X Hercomite Powder	3,475	\$16.581	\$ 576.20	\$ 825.68
No. 1X Gelamite Powder	125	17.392	21.74	
Total Powder 1953			\$ 597.94	
Total Powder 1952				\$ 825.68
Fuse	50,220	9.399	472.06	237.07
Caps	6,190	17.19	106.41	49.45
Elec. Cap & Delays	499	23.13	115.42	
Total Fuse, Caps, Etc.			\$ 693.89	\$ 286.52
Total All Explosives			1291.83	1112.20
Total All Explosives Used at Mine			54169.23	43690.44
Average Price Per Pound for Powder			.1699	.1750

Pumping:

The number of gallons pumped per minute at the Athens Mine in each month of the year for the past ten years is given in the following statement.

Month	1953	1952	1951	1950	1949	1948	1947	1946	1945	1944
January	371	471	348	346	294	331	297	303	306	315
February	366	423	341	341	291	329	290	331	302	297

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7. UNDERGROUND DEVELOPMENT: (Cont'd.)  
Pumping: (cont'd.)

Month	1953	1952	1951	1950	1949	1948	1947	1946	1945	1944
March	355	399	338	324	296	307	287	282	293	296
April	376	390	355	324	299	307	292	327	342	295
May	417	448	466	422	324	327	363	366	365	307
June	468	461	498	471	336	329	385	330	359	312
July	509	440	501	450	337	323	376	321	359	314
August	552	420	525	409	356	331	374	314	355	313
September	467	404	495	387	396	323	368	316	338	311
October	421	397	494	375	373	321	357	316	329	312
November	390	394	499	367	361	310	346	304	325	316
December	377	376	473	350	350	307	346	302	307	308
Average	422	418	444	381	334	320	340	320	332	308

8. COST OF OPENING, EQUIPPING, DEVELOPING & OPERATING:  
Comparative Mining Costs:

	1953	1952	Increase	Decrease
Product	620,080	497,277	122,803	
Underground Costs	2.681	2.954		.273
Surface Costs	.333	.329	.004	
General Mine Expense	.636	.595	.041	
Cost of Production	3.650	3.878		.228
Depreciation	.029	.095		.124
Taxes	.165	.203		.038
Loading & Shipping	.087	.079	.008	
Total Cost at Mine	3.873	4.255		.382
Budget: Estimated Cost at Mine	4.736	4.434		
Number of Shifts & Hours	1-1/8 Hr. 253-2/8 Hr.	6-1/8 Hr. 243-2/8 Hr.	10	5
Number of Days Operated	254	249	5	
Average Daily Product	2441	1997	444	

Proportion of Labor & Supplies:

<u>Cost of Production</u>	1953	Percent	1952	Percent	Increase	Decrease
Labor	2.655	72.73	2.784	71.78		.129
Supplies	.995	27.27	1.094	28.22		.099
Total:	3.650	100.00	3.878	100.00		.228

Detailed Cost Comparison:

Days and Shifts:

Year	Days Mine Operated	Shifts & Hours	Men Employed	Total Shifts Worked
1953	254	1-1/8 Hr. 253-2/8 Hr.	344	507
1952	249	6-2/8 Hr. 5 1/2-2/8 Hr. 5-2/8 Hr.	310	492
Increase	5		34	15
Decrease				

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

Detailed Cost Comparison: (Cont'd.)

Cost of Production:

The decrease of \$0.228 per ton in the cost of production in 1953 is the result of the increased rate of production of 1953 over that of 1952. This was accomplished despite the higher cost of labor and supplies and the difficult mining conditions encountered in 1953.

	<u>1953</u>		<u>1952</u>	
	Amount	Per Ton	Amount	Per Ton
<u>Underground Costs:</u>				
1. Exploring in Mine	\$ 1,192.32	\$ .002		
2. Wage Adjustment	14,025.92	.023	\$ 115,360.25	.232
3. Development in Rock	30,670.99	.050	18,028.07	.036
4. Development in Ore	137,040.06	.221	70,576.60	.142
5. Stopping	468,032.53	.755	375,244.80	.755
6. Timbering	329,453.69	.531	340,745.34	.685
7. Tramming	300,374.48	.484	216,786.80	.436
8. Ventilation	39,879.67	.064	29,066.26	.059
9. Pumping	48,499.54	.078	42,991.59	.086
10. Compressors and Air Pipes	72,439.30	.117	62,874.22	.126
11. Underground Superintendence	107,853.95	.174	85,836.45	.173
<u>Maintenance:</u>				
12. Compressors & Power Drills	165.49		5,754.38	.012
13. Scrapers & Mech. Loaders	45,197.60	.073	50,932.87	.102
14. Tramming Equipment	46,699.06	.075	42,806.22	.086
15. Pumping Machinery	21,298.37	.034	11,877.12	.024
16. Total Underground Costs	\$1,662,822.97	\$2.681	\$1,468,880.97	\$2.954
<u>Surface Costs:</u>				
17. Hoisting	77,568.33	.126	57,334.04	.115
18. Stocking Ore	32,384.44	.053	22,726.01	.046
19. Dry House	17,880.40	.029	17,116.29	.035
20. General Surface Expense	30,590.30	.049	20,182.33	.041
<u>Maintenance:</u>				
21. Hoisting Equipment	28,188.18	.045	19,119.11	.038
22. Shaft	12,510.68	.020	10,038.49	.020
23. Top Tram Equipment	3,878.15	.006	3,917.21	.008
24. Dock, Trestles & Pockets	3,267.49	.005	11,559.87	.023
25. Mine Buildings	230.49		1,498.67	.003
26. Total Surface Costs	\$ 206,498.46	\$ .333	\$ 163,492.02	\$ .329
<u>General Mine Expenses:</u>				
27. Geological	2,842.12	.005	2,504.35	.005
28. Mining Engineering	26,126.66	.042	17,542.72	.035
29. Mechanical & Electrical Eng.	5,793.52	.009	2,719.59	.006
30. Analysis & Grading	37,893.75	.062	28,374.49	.057
31. Safety Department	7,404.62	.012	8,163.91	.017
32. Telephones & Safety Devices	12,296.65	.020	10,636.82	.021
33. Local & Gen. Welfare	3,351.85	.005	3,806.37	.008
34. Spec. Exp., Pensions & Allow.	12,677.07	.020	9,623.60	.019
35. Shipping Office	43,679.28	.071	30,945.46	.062
36. Mine Office	52,080.73	.084	45,538.32	.092
37. Insurance	29,421.62	.047	26,588.21	.053
38. Personal Injury	16,322.45	.026	16,410.49	.033
39. Social Security Taxes	39,640.48	.064	34,978.91	.070
40. Employees Vacation Pay	75,691.83	.122	57,745.92	.116
41. Research Laboratory	1,036.70	.002	281.46	.001
42. Inventory Adjustment			99.84	.000
43. Holiday Pay	22,644.43	.037		
44. Warehouse Retro. Adj.	5,228.28	.008		
45. Total Gen. Mine Expenses	\$ 394,132.04	\$ .636	\$ 295,959.66	\$ .595
46. Cost of Production	2,263,453.47	3.650	1,928,332.65	3.678

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8. COST OF OPENING, EQUIPPING, DEVELOPING AND OPERATING: (Cont'd.)  
Detailed Cost Comparison: (Cont'd.)

E&A AM-24, which covers the rock development for the extension of 8th and 10th levels, was discontinued as of the end of 1953. It is now part of the Master E&A CC-619. All expenditures for this work will be charged to the master E&A, after which the Athens proportion will be transferred to E&A AM-34.

E&A CC-440 was replaced by E&A CC-623 at the end of 1953. This E&A covers exploration of Bunker Hill.

E&A AM-31 was also discontinued and has become a part of the master E&A CC-619, which will cover expenditures after 1953. These expenditures cover the work necessary to complete the development of the Athens and Bunker Hill ore bodies. The Athens share will be transferred to E&A AM-34.

<u>E&amp;A Reference</u>	<u>Total Authorized</u>	<u>Prior Year Expenditures</u>	<u>1953 Expenditures</u>	<u>Total Expenditures</u>
AM-24	\$154,255.00	\$111,207.57	\$ 46,676.32	\$ 157,883.89
CC-440	95,000.00	119,196.32	106,521.06	225,717.38
AM-31	177,000.00	795,214.05	1,036,841.91	1,832,055.96

9. TAXES:

<u>DESCRIPTION</u>	<u>1953</u>		<u>1952</u>	
	<u>VALUATION</u>	<u>TAXES</u>	<u>VALUATION</u>	<u>TAXES</u>
<u>ATHENS MINE</u>				
Including Stockpiles, Supplies & Equipment as placed by State Tax Commission				
Real Estate	\$1,825,000	\$84,588.75	\$1,870,000	\$93,406.50
Personal Property	360,000	16,686.00	455,000	22,727.25
Collection Fee		1,012.75		1,161.34
TOTAL ATHENS MINE	\$2,185,000	\$102,287.50	\$2,325,000	\$117,295.09
Total Rented Buildings	35,140	1,645.05	40,400	2,038.20
TOTAL ATHENS IRON MINING COMPANY	\$2,220,140	\$103,932.55	\$2,365,400	\$119,333.29
<u>BUNKER HILL MINE</u>				
Realty as described and assessed by Michigan State Tax Commission 54.01 A.	\$600,000	\$27,810.00	\$300,000	\$14,985.00
Personal Property - Furnace Houses	5,050	234.07	4,200	209.79
Total		\$28,044.07		\$15,194.79
Collection Fee		280.44		151.95
Total Bunker Hill Mine	\$605,050	\$28,324.51	\$304,200	\$15,346.74

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10. ACCIDENTS AND PERSONAL INJURY:

The following table lists the compensable injuries for 1953:

Fatal . . . . .	0
Time Lost Over 4 Months . . . . .	1
Time Lost 1 to 4 Months . . . . .	5
Time Lost Less Than 1 Month . . . . .	$\frac{14}{20}$
Total:	20

<u>Acc. No.</u>	<u>Date of Accident</u>	<u>Name</u>	<u>Injury</u>	<u>Days Lost</u>
588	1/26/53	Carl Almlı	Contused right foot	17
589	1/22/53	Gust Leaf	Conjunctivitis right eye	13
590	2/12/53	Joseph Misale	Contused chest wall	19
591	2/ 9/53	David R. Davis	Not an accident	--
592	3/21/53	Douglas Francis, Jr.	Partial amputation, left great toe	104
593	3/25/53	John Matthews	Chip fracture, right knee with severe soft tissue injury	51
594	5/11/53	Toivo Lampi	Contusion, right ankle	17
595	5/18/53	Binard Larson	Fracture right fibula	66
596	5/19/53	Bernhardt Luoma	Two inch laceration, left foot	10
597	6/ 9/53	Isaac Pentimaki	Multiple foreign bodies, left side of body and arms and legs	34
598	7/14/53	Wilfred Vassar	Lumbo-sacral strain	18
599	8/28/53	Joseph Misale	Abrasion right shin	14
600	8/19/53	Sherwood Morcom	Laceration, back of left hand	16
601	9/24/53	Anthony Benaglio	Diaphragmatic injury, liver damage	Home
602	8/ 3/53	John Tamminen	Severe laceration, left thumb	30
603	10/14/53	Leo Jarvi	Contusion left leg	9
604	10/15/53	Louis LaJoie	Contusion and multiple foreign bodies, right eye	8
605	11/ 5/53	Elmer Williamson	Contusion left foot	14
606	11/ 6/53	Binard Larson	Laceration, base of left thumb	19
607	11/11/53	Leonard Beauprey	Lacerations of mouth	7
608	11/14/53	Arthur Borlace	Strained back	19

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11. POWER:

Power is purchased according to standard schedule defined as follows:

\$.041 per k.w.h. for the first 72 k.w.h. of demand and \$.0096 per k.w.h. for all additional k.w.h. The demand is the lowest average k.w. of the three fifteen minute periods of maximum use during the month.

The fuel adjustment is in addition to the above and is a factor depending on the cost of coal as delivered. That is \$.00018 per k.w.h. for each \$.01 over \$.29 in company's cost per million B.T.U. This adjustment does not apply to the total k.w.h. as part of the power is furnished by hydro-electric plants.

The following table lists the costs of power for the year 1953:

Compressor	\$ 40,140.16
Hoisting	41,888.40
Pumping	28,729.86
Shops	500.44
Dry House	822.30
Office	126.06
Stoping	8,372.49
Ventilation	13,949.79
Surface	478.27
Electric Haulage	9,003.24
#31 Power Shovel	825.95
Miscellaneous	5,371.19
Total:	<u>\$150,208.15</u>

The twelve month average for 1953 is \$.0154 per k.w.h.

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1. GENERAL

The production for 1953 was 350,700 tons or an average of 1,403 tons per day, as compared with a production of 345,000 tons in 1952 or an average of 1,364 tons per day. The tons per man per day was 6.03, as compared with 6.28 in 1952. The total cost per ton was 4.816, as compared with a budget estimate of 4.852 and a total cost per ton of 4.419 in 1952. All of the ore placed on stock during the 1952-53 stocking season was loaded out during the shipping season.

During June a general wage increase was granted to all employees, and in July an increase in wages was made according to the classification of the employee by the job classification program. This increase in wages actually amounted to about 10%, and is reflected in the cost per ton.

During the year a program of exploration on the 6th level in the east end of the Jackson strip was completed, with no new reserves being outlined. A program of exploration in this same area on the 7th level has thus far been very encouraging, and indicates ore concentration both above and below the 7th level elevation. The east end of the Jackson strip is the only area remaining in the mine that has not been thoroughly explored.

In general, conditions during the year were favorable and a very satisfactory year resulted. The working schedule continued on a five-day per week basis throughout the year, and there were no major breakdowns. Overtime underground repair work on Saturdays averaged about 15% of the working force.

Mining operations in 1953 were scattered along the entire length of the narrowing orebody (2,400 feet). As the lower extremities of the ore areas were reached, it was necessary to carry on an increased amount of rock development. Near the end of the year, 15 of the 19 mining contracts were caving drifts of 35 feet or less in length.

2. PRODUCTION

a. Production by Grade and Months

<u>Month</u>	<u>Jackson Strip</u>	<u>Rock</u>
January	33,609	1,060
February	32,923	1,516
March	34,972	1,784
April	30,731	1,816
May	29,360	1,864
June	28,399	1,940
July	21,285	1,424
August	24,737	444
September	27,349	500
October	32,457	876
November	27,218	724
December	27,660	1,452
Total 1953	350,700	15,400
Total 1952	345,000	15,384
Increase	5,700	16

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2. PRODUCTION (CONTINUED)

b. Shipments

	<u>Pocket Tons</u>	<u>Stockpile Tons</u>	<u>Total Tons</u>
Jackson Strip 1953	202,384	147,238	349,622
Jackson Strip 1952	<u>206,847</u>	<u>138,666</u>	<u>345,513</u>
Increase	-	8,572	4,109
Decrease	4,463	-	-

Shipments increased 1.2% in 1953, and were 1,078 tons less than the product for the year. On December 31st, 1953, there were 40,127 tons remaining in stock.

During 1953 there was no mining or product from the Cambria lease.

c. Ore Statement

	<u>1953</u>	<u>1952</u>
On hand Jan. 1, 1953	39,049	39,562
Output for year	342,603	338,506
Overrun	<u>8,097</u>	<u>6,494</u>
Total	389,749	384,562
Shipments	<u>349,622</u>	<u>345,513</u>
Bal. on hand Dec. 31, 1953	40,127	39,049
Increase in output	4,097	-
Decrease in output	-	4,581
Increase in ore on hand	1,078	-
Decrease in ore on hand	-	513

Days per Week Operating

1953 - Five 2-8 hour shifts 1-1-53 to 12-31-53.

1952 - Six 2-8 hour shifts 1-1-52 to 5-1-52.  
Five and one-half 2&3-8 hour shifts 5-1-52 to 11-15-52.  
Five 2-8 hour shifts 11-17-52 to 12-31-52.

1951 - Six 2-8 hour shifts 1-1-51 to 12-31-51.

1950 - Five 2-8 hour shifts 1-1-50 to 8-28-50.  
Six 2-8 hour shifts 8-28-50 to 12-31-50.

1949 - Six 2-8 hour shifts 1-1-49 to 6-27-49.  
Five 2-8 hour shifts 6-27-49 to 12-31-49.



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2. PRODUCTION (CONTINUED)d. Division of Product by Levels and Months

<u>Month</u>	<u>7th Level</u>	<u>8th Level</u>	<u>Total</u>
January	7,222	26,387	33,609
February	3,711	29,212	32,923
March	848	34,124	34,972
April	4,049	26,682	30,731
May	1,840	27,520	29,360
June	1,514	26,885	28,399
July	2,194	19,091	21,285
August	3,206	21,531	24,737
September	3,980	23,369	27,349
October	5,564	26,893	32,457
November	5,394	21,824	27,218
December	7,484	20,176	27,660
Total 1953	<u>47,006</u>	<u>303,694</u>	<u>350,700</u>
Total 1952	<u>78,558</u>	<u>266,442</u>	<u>345,000</u>
Increase	-	37,252	5,700
Decrease	31,552	-	-

The product by months under the 7th level heading includes only the ore mined on and above this level, but not necessarily trammed. Because of the inside conveyor which elevates the ore from the 8th to the 7th level, where it is trammed to the main shaft, this statement can only be used to check relative estimated reserves between levels.

e. Production Delays

There were no major production delays in 1953.

3. ANALYSISa. Average Mine Analysis on Output

<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Sulph.</u>
57.80	.095	9.75	.222

b. Average Analysis of Shipments - Dried

<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Sulph.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Loss</u>	<u>Moist.</u>
58.00	.101	9.32	.21	2.75	.233	.65	.34	2.50	12.44

c. Average Analysis of Ore in Stock - Natural

<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Sulph.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Loss</u>	<u>Moist.</u>
49.89	.089	9.97	.19	2.41	.184	.62	.30	2.06	12.27

d. Analysis of Straight Cargo Shipments

All ore shipped was mixed with other grades.

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4. ESTIMATE AND ANALYSIS OF ORE RESERVES

The ore reserves which have been estimated for the Cambria-Jackson mine are located in the Jackson strip only, and include high-sulphur and standard grades of ore. The engineers' estimate, adjusted to the end of the year, indicates that approximately 120,000 tons of ore were developed during the year. The 7th level exploration drifting and drilling have increased the reserves by approximately 300,000 tons, as indicated by the ore horizons being encountered.

Comparison of Production to Reserves

Reserves on Jan. 1, 1953	603,009
Production Jan. 1 to Dec. 31, 1953	<u>350,700</u>
Balance	252,309
Reserves as of Dec. 31, 1953	<u>375,035</u>
New Ore Developed	<u>122,726</u>

To summarize the general prospects for the future life of the Cambria-Jackson mine, it is well to mention that the 7th level exploration program in the east deposit has been showing very favorable results, with ore horizons being encountered both above and below the 7th level elevation. However, these horizons are not new orebodies, only extensions of the east deposit. The program of exploration in this area will continue during 1954.

Developed Ore

Assumption            12.00 cubic feet equals one ton.  
10% deduction for loss in mining and rock.

Percentage  
of Bessemer            None.

<u>Area</u>	<u>Sulphurous Ore</u>		<u>Total</u>
	<u>Negaunee</u>	<u>Ishpeming</u>	
Between 6th and 7th levels	112,094	-	112,094
Between 7th and 8th levels	227,540	229,235	456,775
Gross as of July 31, 1953	<u>339,634</u>	<u>229,235</u>	<u>568,869</u>
Less August 1953 Production	8,752	15,985	24,737
Gross as of Aug. 31, 1953	<u>330,882</u>	<u>213,250</u>	<u>544,132</u>
Less Prod. (Sept., Oct., Nov. & Dec.)	52,767	61,917	114,684
Gross as of Dec. 31, 1953	<u>278,115</u>	<u>151,333</u>	<u>429,448</u>
Less 10% for Mining & Rock	<u>33,088</u>	<u>21,325</u>	<u>54,413</u>
Net total reported to Michigan State Tax Commission as of December 31st, 1953	245,027	130,008	375,035

Expected Average Natural Analysis of Ore Reserves, Based on Tax Commission Figures

<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Sulph.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Loss</u>	<u>Moist.</u>
52.50	.105	6.56	.11	2.44	.224	.61	.44	1.69	12.50

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5. LABOR AND WAGES

Labor Relations

Labor relations between the mine management and the union grievance committee and the employee members have been excellent. No formal grievances were filed in 1953. Regular monthly meetings were held with the grievance committee to discuss various matters, and all complaints have been handled locally.

As of December 31, 1953, there were 225 men on the payroll, as compared with 231 the preceding year. The general turnover is about average for the past few years. However, in line with an anticipated decrease in production for 1954, all of the separations that were made for various reasons have not been replaced.

The following table is a breakdown of the employment record:

Employment

Number of men beginning of year	231
Added during the year	29
Separations	35
Total end of year	225
Average number of men, as per December Labor Statement	234

Accessions

Straight hires	21
Transferred from other mines	2
Temporary hires	3
Returned from military service	3
Total	<u>29</u>

Separations

Accepted other employment	15
Transferred to other mines	7
Inducted into military service	5
Returned to school (temporary hires)	4
Retired	3
Discharged	1
Total	<u>35</u>

Paid Holidays

	<u>Number of Men</u>	<u>Amount</u>
New Year's Day	204	3,260.72
Memorial Day	219	3,504.46
Independence Day	206	3,533.88
Labor Day	205	3,507.20
Thanksgiving	198	3,462.56
Christmas	197	3,373.16
Average and Total	<u>205</u>	<u>20,641.98</u>

Vacations

<u>Year</u>	<u>Amount</u>
1953	44,245.11
1952	36,594.73

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5. LABOR AND WAGES (CONTINUED)

Statement of Wages

<u>Average Wages per Day</u>	<u>1953</u>	<u>1952</u>	<u>Increase</u>	<u>Decrease</u>
Surface	16.82	15.55	1.27	-
Underground	17.54	17.80	-	.26
Contract Labor	21.71	18.48	3.23	-
Total	18.66	17.30	1.36	-
<u>Average Wages per Month</u>				
Surface	345.51	318.13	27.38	-
Underground	365.95	364.16	1.79	-
Contract Labor	447.92	378.07	69.85	-
Total	386.63	353.93	32.70	-
<u>Avg. Days Worked per Month</u>	20.83	20.46	.37	-
<u>Tons per Man per Day</u>				
Surface	27.35	28.04	-	.69
Underground	7.73	8.09	-	.36
Total	6.03	6.28	-	.25
<u>Labor Cost per Ton</u>				
Surface	.615	.554	.061	-
Underground	2.481	2.200	.281	-
Total	3.096	2.754	.342	-

6. SURFACE

There were no major alterations or changes in the surface plant during the year. All buildings were maintained and repaired, and are in good condition.

As a result of a severe windstorm on June 19th at about 12:30 P.M., a portion of the sheathing on the south side of the shafthouse was blown off. The total cost of repairs was \$371.96, all of which was covered by insurance. On September 12th, a high velocity windstorm ripped the roofing off the north slope of the engine house. This roof was fifteen years old, and rather than repair only the windstorm damage the whole roof was rejuvenated. The windstorm damage was covered by insurance to the amount of \$558.02, with the total cost of rejuvenation being \$997.79.

In July, E. & A. No. CC-581 was authorized for the purchase of a new model H-3 hydrocrane, costing \$13,500.00 less a trade-in allowance of \$5,000.00 on the old unit. Delivery of the new unit was accepted on July 30. These hydrocrane units are extremely efficient in their use around the mine, and are very much in demand by other Company properties.

Loading from the stockpile was completed early in July and the 54-B diesel shovel was shipped to the Lloyd mine, where it was used for the remainder of the shipping season.

The mine discharge is pumped into an open ditch south of the shaft, from where it flows into Partridge creek. Surface subsidence southwest of the shaft continues to be very active, and regular surveys are made of all new cracks and openings around the perimeter of the main cave. To date, there is no evidence of any discharge water being lost to subsidence areas.

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7. UNDERGROUND

Shaft Sinking

There was no sinking carried on in the main shaft during 1953.

General

The operation of the Cambria-Jackson mine in 1953 was generally quite favorable. The production was well over the estimated figure and, despite the increased exploration and development work, increased wages, and increased cost of supplies, the cost of production per ton was below the estimated budget cost. The analysis of the ore produced remained high, and all stockpiled ore was completely shipped out early in July.

All of the production came from three areas, the east, central, and west deposits, above and below the 7th level. In the west deposit the second sublevel below the 7th level was completed and, by the close of the year, the number of mining gangs in this area was cut from eleven to four. In the central deposit five gangs continued mining operations throughout the year, between the 7th and 8th levels. In the east deposit a great amount of exploration-development work was done, on and above the 7th level elevation. Approximately 1,350 feet of drifting was done in extending the 7th level drift to the east, for further exploration and development work. A drilling program was started from the 7th level extension, to further explore the area below the 7th level. The results of this development work have been very encouraging. The ore being outlined on and above the 7th level lies along a narrow, persistent dike, and is very irregular in both its horizontal and vertical dimensions. To date, the ore is of low-sulphur grade, and should substantially reduce the average sulphur analysis of future production.

The exploration program, under E. & A. No. CC-486, on the 6th level was completed during the year, with very disappointing results. Nine diamond drill holes were drilled from various locations, with 3,215 feet of hole being drilled and only 105 feet of intermittent ore being cut. No mineable ore areas were intercepted.

At the end of 1953 there were nineteen active contracts in operation, and this number has been constant for some time past. An average of thirteen contracts were conducting caving and pre-caving operations during the year, and six in exploration or rock work. Thus, the entire production of 350,700 tons was produced by 68% of the active contracts, which further indicates the constant effort to explore and develop additional ore.

Development and Stopping

The development throughout the year was largely concentrated on the 7th level, where a large area to the south and east of the main shaft is as yet only partly explored. Approximately 1,350 feet of main level drift and crosscuts were driven to explore and develop this area for mining. At the close of the year, diamond drilling had been started to further explore the area below the 7th level elevation. Several ore horizons were cut by the drifting, and the overall results of this program have been very encouraging.

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7. UNDERGROUND (CONTINUED)

Development and Stopping (Continued)

In December seven contracts were mining and developing in this east territory and, due to the irregular nature of the ore, productivity has been relatively low. It appears that the ore is widening to the east and rising on the normal pitch of the orebody. Further development during the coming year may well find sufficient ore to offset the 1953 production.

In the west deposit, sublevel caving operations were being carried on by eleven contracts early in the year. As the upper area was exhausted and mining reached the lower elevations, the number of gangs was reduced as their mining areas were depleted. At the close of the year, there were four active contracts in this area.

The west deposit is a long narrow wedge, tapering to a point below the 8th level. As a result, with each successive drop in elevation, the flat footwall greatly shortens the length of the crosshauls off the main east-west transfers, and decreases the amount of ore recovered per foot of mining drift required. On the bottom sublevel, the width of ore will only permit the caving of the main east-west transfer drift.

The central deposit, located north of the main east-west dike and west of the fault dike, was exhausted above the 7th level, and mining was continued on the first sublevel below. In the west end of this deposit, mining was nearly completed above the second sublevel elevation. A large pillar is being left in this area to protect the 8th level plat and feeder station. In general, the central deposit is much softer than the ore in the west deposit.

Mining in the east deposit has been carried on above the 7th level, on the north and south sides of an east-west running dike. During the year, operations above the fourth sublevel elevation were completed and caving started on the third sublevel elevation. Development work, on and just above the 7th level, indicates an eastward trend of this ore that may extend to the 8th level elevation. This area is being used to supply working places for gangs that are being moved out of the west deposit, as it is being exhausted.

Diamond Drilling

In November, 1952, a program of diamond drilling was started on the 6th level to thoroughly explore the east end of the Jackson strip, at and below the 6th level elevation. The cost of this program was capitalized under E. & A. No. CC-486, and allowed for 2,000 feet of drilling at a cost of \$8.00 per foot. An incentive system, based on footage drilled and core recovered which was set up in conjunction with the Industrial Engineering department and the Geological department, resulted in the cost of drilling being lowered to \$6.13 per foot. A total of 3,215 feet of hole was drilled, as a result of this saving.

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7. UNDERGROUND (CONTINUED)

Diamond Drilling (Continued)

The incentive system used called for a minimum core recovery of 50%, and a bonus was paid based on footage drilled per shift on completion of the hole. The minimum footage per shift before bonus rates were paid was determined by the size of hole, dip of hole, length of pull, and other conditions. As can be seen by the cost per foot of hole drilled, the incentive system was very successful.

Drilling from the 6th level was concluded during the latter part of the year, with very disappointing results. Nine holes were drilled (8 in 1953) for a total footage of 3,215 feet, only 105 feet of intermittent ore intercepted, and no mineable ore areas discovered.

Upon completion of drilling on the 6th level, a similar program from the 7th level east exploratory drift was started, to further explore the east end of the Jackson strip below the 7th level elevation. Inasmuch as E. & A. No. CC-486 was not completely expended on the 6th level, some of the 7th level drilling was capitalized in this account.

A complete listing of the diamond drill holes and logs is indicated below:

No. of Hole	209.	Footage and Material	Fe.	P.	SiO <sub>2</sub> .	S.
<u>Location</u>	6th lev.E.	0' to 27' - Rich. hem. cherty iron formation				
	S367.84 &	27' to 38' -	46.20	.053	30.20	-
	8285.62W	38' to 41' - Rich hem. arg. cherty iron form.				
<u>Dip</u>	-90°.	41' to 46' -	50.40	.035	-	.021
<u>Course</u>	-	46' to 60' -	57.05	.057	-	.025
<u>Elevation</u>	1104.22'.	60' to 61' -	46.30	.045	-	-
		61' to 147' - Rich hematitic cherty iron form.				
	(Started 1-2-53 -	147' to 237' - Rich hem. arg. cherty iron form.				
	Completed 1-26-53.)	237' to 254' - Argillite				

No. of Hole	210.	Footage and Material	Fe.	P.	SiO <sub>2</sub> .	S.
<u>Location</u>	6th lev.E.	0' to 64' - Rich hem. cherty iron formation				
	S472.94 &	64' to 130' - Rich hem. arg. cherty iron form.				
	8193.92W	130' to 213' - Rich hem. cherty iron formation				
		213' to 244' - Rich hem. arg. cherty iron form.				
<u>Dip</u>	-90°.	244' to 258' -	58.93	.060	-	.170
<u>Course</u>	-	258' to 280' - Rich hem. arg. cherty iron form.				
<u>Elevation</u>	1106.49'.					
	(Started 1-27-53 -					
	Completed 3-2-53.)					

No. of Hole	211.	Footage and Material	Fe.	P.	SiO <sub>2</sub> .	S.
<u>Location</u>	6th lev.E.	0' to 61' - Rich hem. cherty iron formation				
	S458.72 &	61' to 67' - Intrusive				
	8189.60W	67' to 146' - Rich hem. cherty iron formation				
		146' to 221' - Rich hem. arg. cherty iron form.				
<u>Dip</u>	2°-00'.	221' to 304' - Rich hem. cherty iron formation				
<u>Course</u>	N33°-52'E.	304' to 417' - Rich hem. arg. cherty iron form.				
<u>Elevation</u>	1110.30'.					
	(Started 3-3-53 -					
	Completed 4-27-53.)					

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7. UNDERGROUND (CONTINUED)Diamond Drilling (Continued)

<u>No. of Hole</u>	<u>Footage and Material</u>	<u>Fe.</u>	<u>P.</u>	<u>SiO<sub>2</sub>.</u>	<u>S.</u>
<u>Location</u> 212. 6th lev.E.	0' to 133'	- Rich hem. cherty iron formation			
S462.66 &	133' to 138'	- Intrusive			
8188.67W	138' to 280'	- Rich hem. arg. iron formation			
<u>Dip</u> -40°-00'.					
<u>Course</u> N34°-47'E.					
<u>Elevation</u> 107.49'.					
(Started 4-28-53 -					
Completed 5-21-53.)					
<u>No. of Hole</u> 213.	0' to 43'	- Norm. hem. cherty iron formation			
<u>Location</u> 6 lev.E.	43' to 55'	- Intrusive			
S457.55 &	55' to 72'	- Norm. hem. cherty iron formation			
7793.68W	72' to 87'	- Intrusive			
<u>Dip</u> -40°-00'.	87' to 90'	- Ferr. intrusive			
<u>Course</u> N1°-39'E.	90' to 187'	- Rich hem. cherty iron formation			
<u>Elevation</u> 110.70'.	187' to 232'	- Norm. hem. arg. iron formation			
(Started 5-22-53 -	232' to 290'	- Lean argillaceous iron formation			
Completed 6-12-53.)					
<u>No. of Hole</u> 214.	0' to 29'	- Norm. hem. cherty iron formation			
<u>Location</u> 6 lev.E.	29' to 35'	- Intrusive			
S456.25 &	35' to 104'	- Rich hem. cherty iron formation			
7793.85W	104' to 110'	48.20	.053	-	-
<u>Dip</u> 2°-00'.	110' to 115'	- Rich hem. cherty iron formation			
<u>Course</u> N1°-58'W.	115' to 120'	45.60	.033	-	-
<u>Elevation</u> 114.77'.	120' to 175'	- Rich hem. cherty iron formation			
(Started 6-15-53 -					
Completed 7-8-53.)					
<u>No. of Hole</u> 215.	0' to 45'	- Argillite			
<u>Location</u> 6 lev.E.	45' to 63'	- Intrusive			
N302.81 & 8833.88W	63' to 83'	- Argillite			
<u>Dip</u> 20°-00'.	83' to 93'	- Lean hem.arg.cherty iron formation			
<u>Course</u> S25°-50'W.	93' to 228'	- Argillite			
<u>Elevation</u> 107.29'.	228' to 238'	- Lean hem.arg.cherty iron formation			
(Started 7-9-53 -	238' to 326'	- Norm. hem. arg. cherty iron form.			
Completed 9-4-53.)	326' to 377'	- Normal hematitic cherty iron form.			
(Re-entered 11-4-53 -	377' to 385'	- Intrusive			
Completed 11-16-53.)	385' to 389'	- Rich hematitic cherty iron form.			
	389' to 407'	- Ferruginous intrusive			
	407' to 425'	- Rich hematitic cherty iron form.			
	425' to 430'	46.23	.050	-	-
	430' to 445'	- Rich hematitic cherty iron form.			
	445' to 495'	58.67	.069	-	.056
	495' to 505'	- Rich hematitic cherty iron form.			
	505' to 530'	- Normal hematitic cherty iron form.			
<u>No. of Hole</u> 216.	0' to 54'	- Argillite			
<u>Location</u> 6 lev.E.	54' to 72'	- Intrusive			
N302.72 & 8833.90W	72' to 73'	- Argillite			
<u>Dip</u> 5°-00'.	73' to 108'	- Oxidized Iron Formation			
<u>Course</u> S25°-19'W.	108' to 120'	- Argillite			
<u>Elevation</u> 106.29'.	120' to 132'	- Hematitic cherty iron formation			
(Started 9-23-53 -	132' to 250'	- Argillite			
Completed 11-3-53.)	250' to 289'	- Norm.hem.Goeth.cherty iron form.			



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7. UNDERGROUND (CONTINUED)Diamond Drilling (Continued)

No. of Hole (Continued)	216.	Footage and Material	Fe.	P.	SiO <sub>2</sub> .	S.
		289' to 338' - Norm.hem.arg.cherty iron form.				
		338' to 365' - Intrusive				
		365' to 380' - Rich hem.arg.cherty iron form.				
		380' to 440' - Rich hematitic cherty iron form.				
		440' to 445' -	45.80	.078	-	-
		445' to 457' - Rich hematitic cherty iron form.				
		457' to 470' -	45.80	.056	-	-
		470' to 472' - Rich hematitic cherty iron form.				
		472' to 491' -	48.39	.114	-	.013
		491' to 510' - Rich hematitic cherty iron form.				
		510' to 515' -	53.80	.109	-	-
		515' to 522' - Lean hematitic cherty iron form.				
		522' to 535' - Rich hem.Goeth.cherty iron form.				
		535' to 540' -	49.10	.085	-	-
		540' to 570' - Normal hematitic cherty iron form.				
		570' to 581' - Lean hematitic cherty iron form.				
No. of Hole	217.	0' to 6' - No core				
Location	7th lev.	6' to 16' - Rich hematitic cherty iron form.				
	S526.33 & 9198.37W	16' to 35' -	50.35	.060	-	.024
Dip	-26°-00'.	35' to 75' - Normal hematitic cherty iron form.				
Course	N00°-47'E.	75' to 90' -	53.64	.066	-	.015
Elevation	-95.37'.	90' to 103' -	58.44	.121	-	.017
(Started	11-17-53 -	103' to 105' -	51.82	.095	-	-
Completed	1-5-54.)	105' to 110' -	48.19	.125	-	.006
		110' to 120' -	54.06	.076	-	-
		120' to 155' -	61.69	.110	-	.020
		155' to 165' -	46.80	.080	-	.013
		165' to 180' -	52.33	.044	-	-
		180' to 185' -	59.35	.138	-	-
		185' to 190' -	45.20	.098	-	-
		190' to 200' - Rich hematitic cherty iron form.				
		200' to 201' - Intrusive				
		201' to 205' -	59.26	.181	-	.021
		205' to 210' -	53.96	.119	-	.039
		210' to 230' -	60.84	.116	-	.177
		230' to 256' -	53.78	.102	-	-
		256' to 280' -	56.34	.074	-	1.379
		280' to 300' -	46.59	.086	-	-

Statement of Timber Used

	Lineal Feet		Average Price per Foot		Amount	Amount
	1953	1952	1953	1952	1953	1952
Stulls	40,457	42,442	.2245	.2401	9,081.80	10,191.04
Square Cribbing	14,332	19,468	.0912	.1042	1,307.06	2,027.76
Round Cribbing	35,711	5,570	.0874	.0867	3,119.51	483.18
Lagging	693,990	598,264	.0200	.0227	13,883.98	13,565.87
Poles	197,521	185,468	.0380	.0352	7,500.24	6,525.07
Steel H Beams	1,576	9,117	.9218	.7757	1,452.69	7,071.84
Total					36,345.28	39,864.76

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7. UNDERGROUND (CONTINUED)

Statement of Timber Used (Continued)

The amount of timber used underground was substantially the same as in 1952, with the exception of the amount of cribbing which was increased because of the large amount of raising that was done in the development of the east deposit above the 7th level. Steel H-beams are being used in place of timber in main level drifting and repair work, because of increased strength and complete freedom from rotting. A much smaller amount of steel was used in 1953, because most of the old 7th and 8th level drifts were relined with steel in 1952. In addition, most of the main level drifts driven during the year did not require support.

Explosives

	<u>Quantity</u>	<u>Average Price</u>	<u>Amount 1953</u>	<u>Amount 1952</u>
Gelamite #1X - Lbs.	41,850	.1737	7,269.82	4,519.77
Hercomite #2X - Lbs.	167,200	.1675	28,007.22	28,502.57
Gelatin 5x5 60% - Lbs.	3,550	.2250	798.75	-
Gelatin 4x2 60% - Lbs.	8,150	.2330	1,899.27	-
Total Powder	220,750	.1720	37,975.06	33,022.34
Fuse, Caps, Etc.			9,537.53	7,302.07
Tot.Exps.,Development & Mining			47,512.59	40,324.41
Hercomite #2X - Lbs.	-	-	-	32.00
Fuse, Caps, Etc.	-	-	-	34.40
Tot.Exps.,Tramming Equipment				66.40
Gelamite #1X - Lbs.	-	-	-	3,454.20
Hercomite #2X - Lbs.	-	-	-	359.70
Total Powder				3,813.90
Fuse, Caps, Etc.				608.62
Tot.Exps.,E.&A. No. CC-486				4,422.52
Grand Total Explosives Used in Mine			47,512.59	44,813.33
Average Price per Pound for Powder			.1720	.1649

Pumping

The average G. P. M. pumped during the year was 348, as compared with 376 in 1952. These totals are directly proportional to the climatic conditions throughout the year. The peak pumping period occurred in July with 499 G. P. M., as compared with the peak in May, 1952, of 550 G. P. M. All pumping equipment has been maintained in good condition, and all sumps were cleaned at least once during the year.

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

Comparative Mining Costs

	<u>1953</u>	<u>1952</u>	<u>Increase</u>	<u>Decrease</u>
Product	350,700	345,000	5,700	-
Underground Costs	3.259	3.006	.253	-
Surface Costs	.346	.284	.062	-
General Mine Expenses	.693	.582	.111	-
Cost of Production	4.298	3.872	.426	-

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8. COST OF OPENING, EQUIPPING,  
DEVELOPING, AND OPERATING (CONTINUED)

## Comparative Mining Costs (Continued)

	1953	1952	Increase	Decrease
Depletion and Depreciation	.196	.209	-	.013
Taxes	.156	.181	-	.025
Loading and Shipping	.063	.068	-	.005
Rental-Shaft Facilities	.103	.089	.014	-
Total Cost at Mine	4.816	4.419	.397	-
Budget Est'd Cost per Ton	4.852	4.785	.067	-
No. of Shifts & Hours	1-8 2	15	-	13
	2-8 248	238	10	-
No. of Days Operated	250	253	-	3
Average Daily Product	1,403	1,364	39	-

## Proportion of Labor and Supplies

	1953	Percent	1952	Percent	Increase
Labor	3.286	68.2	2.933	66.4	.353
Supplies	1.530	31.8	1.486	33.6	.044
Total	4.816	100.0	4.419	100.0	.397

## Detailed Cost Comparison

Days per Week	1953	1952
	5	6 to 5-1-52 5½ to 11-17-52 5 bal. of yr.
Shifts and Hours	1-8 2 2-8 248	1-8 15 2-8 238
Production, Tons	350,700	345,000
Average Daily Production, Tons	1,403	1,364
Number of Days Worked	250	253

## UNDERGROUND COSTS

	Amount	Per Ton	Amount	Per Ton
1. Exploring in Mine	1,465.19	.004	16,761.22	.049
2. Estimated Wage Adjustment	258.59	.001	74,572.36	.216
3. Development in Rock	83,149.15	.237	23,502.61	.068
4. Development in Ore	47,326.00	.135	63,816.65	.185
5. Stopping	335,485.54	.956	298,609.33	.866
6. Timbering	186,179.52	.531	157,077.21	.455
7. Trammig	221,966.75	.633	196,855.31	.571
8. Ventilation	14,820.72	.042	13,613.29	.039
9. Pumping	43,044.16	.123	33,538.96	.097
10. Compressors and Air Pipes	48,449.12	.138	43,702.68	.127
12. Underground Superintendence	72,566.37	.207	38,089.20	.110
14. Maint.: Comp. & Power Drills	6,191.92	.018	2,539.98	.007
15. Scrapers & Mech. Loaders	28,757.07	.082	31,989.82	.093
16. Trammig Equipment	49,813.12	.142	37,447.26	.109
17. Pumping Machinery	4,146.13	.012	4,862.30	.014
Total Underground Costs	1,143,102.17	3.259	1,036,978.18	3.006

## SURFACE COSTS

18. Hoisting	38,627.93	.110	31,624.38	.094
19. Stocking Ore	17,251.24	.049	15,632.57	.045
21. Dry House	12,489.79	.036	10,614.06	.030
22. General Surface Expense	25,062.10	.071	18,524.29	.053
23. Maint.: Hoisting Equipment	16,016.67	.046	11,750.96	.034
24. Shaft	7,983.99	.023	5,605.74	.016
25. Top Tram Equipment	2,678.04	.008	1,797.29	.005
26. Docks, Trestles & Pockets	106.45	.000	894.55	.002
27. Mine Buildings	951.20	.003	1,692.08	.005
Total Surface Costs	121,167.41	.346	98,135.92	.284

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8. COST OF OPENING, EQUIPPING,  
DEVELOPING, AND OPERATING (CONTINUED)

	<u>1953</u>		<u>1952</u>	
	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>
<u>Detailed Cost Comparison (Continued)</u>				
<u>GENERAL MINE EXPENSES</u>				
28. Geological	2,139.39	.006	568.45	.002
29. Mining Engineering	8,362.78	.024	10,519.31	.030
30. Mechanical & Electrical Engineering	2,299.32	.007	1,373.40	.004
31. Analysis and Grading	17,292.54	.049	17,134.06	.050
32. Safety and Personnel Departments	3,776.67	.011	2,936.07	.008
33. Telephones and Safety Devices	9,598.26	.027	7,824.15	.023
34. Local and General Welfare	2,324.01	.007	2,835.55	.008
35. Special Exp., Pensions & Allowances	8,835.36	.025	5,883.17	.017
36. Ishpeming Office	30,313.25	.086	24,279.85	.070
37. Mine Office	35,465.12	.101	34,735.90	.101
38. Insurance	24,596.78	.070	18,026.81	.052
39. Personal Injury	7,807.60	.022	10,321.46	.030
40. Social Security Taxes	23,096.24	.066	21,485.96	.062
41. Employees Vacation Pay	48,625.11	.139	42,479.53	.123
42. Holiday Pay	17,473.75	.050	-	-
43. Research Laboratory	1,101.42	.003	560.01	.002
Total General Mine Expenses	<u>243,107.60</u>	<u>.693</u>	<u>200,963.68</u>	<u>.582</u>
 COST OF PRODUCTION	 1,507,377.18	 4.298	 1,336,077.78	 3.872

In the comparison of costs it should be noted that, with but few exceptions, all items have increased over the previous year, due to a general increase in wages and cost of supplies. In some cases, the increases or decreases have already been explained by the difference in the amount of one type of work over another.

E.&A. No. CC-486 and E.&A. No. CC-581

E. & A. No. CC-486 was authorized late in 1951 to cover the cost of exploring the east end of the Jackson strip, as previously described in this report.

	<u>Amount Authorized</u>	<u>Expended</u>	<u>Unexpended</u>
<u>Development:</u>			
Drifting 1,200' on 6th level	42,000.00	36,894.74	5,105.26
New trench & repair skip pocket	5,000.00	5,532.24	532.24
<u>Drilling:</u>			
Diamond drilling 2,000'	16,000.00	19,633.80	3,633.80
Laboratory expense	-	220.01	220.01
Miscellaneous	7,000.00	-	7,000.00
Social security taxes	-	905.15	905.15
Geological	-	4,397.15	4,397.15
Superintendence	-	2,314.34	2,314.34
Total	<u>70,000.00</u>	<u>69,897.43</u>	<u>102.57</u>

E. & A. No. CC-581 was authorized in May, 1953, to purchase a model H-3 hydrocrane, as a replacement unit for an older model which was badly in need of repairs.

	<u>Amount Authorized</u>	<u>Expended</u>	<u>Unexpended</u>
Model H-3 Hydrocrane (Bucyrus-Erie)	13,500.00		
Less: Trade-in allowance	5,000.00		
Net Cost	<u>8,500.00</u>	<u>7,160.29</u>	<u>1,339.71</u>

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9. TAXES

	<u>1953</u>		<u>1952</u>	
	<u>Valuation</u>	<u>Taxes</u>	<u>Valuation</u>	<u>Taxes</u>
<u>Cambria Realty</u>				
S $\frac{1}{2}$ of SE $\frac{1}{4}$ of Sec. 35, 48-27 )				
Lots 7 & 8 of Sec. 35, 48-27 )				
Lots 5, 6 & 7 of Sec. 36, 48-27)				
- 222.09 Acres)	200,000	9,270.00	200,000	9,990.00
<u>Jackson Strip</u>				
N660' of N $\frac{1}{2}$ of NW $\frac{1}{4}$ of Sec. 1, )				
47-27                                 -40 Acres )	590,000	27,346.50	905,000	45,204.75
<u>Personal Property</u>				
Stockpiles, Supplies & Equipment	300,000	13,905.00	250,000	12,487.50
Tot. by Mich. State Tax Com.	1,090,000	50,521.50	1,355,000	67,682.25
Collection Fee		505.22		676.82
Total Taxes, Negaunee	1,090,000	51,026.72	1,355,000	68,359.07
<u>Division of Payments</u>				
Cambria-Jackson Taxes, Ishpeming*	100,000	3,895.00	100,000	3,735.00
Cambria-Jackson Taxes, Negaunee	1,090,000	51,026.72	1,355,000	68,359.07
TOTAL	1,190,000	54,921.72	1,455,000	72,094.07

\*Cambria-Jackson Mine-Ishpeming  
N660' of NE $\frac{1}{4}$  of NE $\frac{1}{4}$  of Sec. 2, )  
47-27                                 - 20 Acres)

<u>Tax Rate per \$100 of Valuation</u>	<u>1953</u>	<u>1952</u>
City of Negaunee	4.635	4.995
City of Ishpeming	3.895	3.735
Total Taxes, City of Negaunee	833,573.05	856,059.08
<u>Cambria-Jackson Percent of Taxes</u>		
City of Negaunee	6.06	7.91

10. ACCIDENTS AND PERSONAL INJURY

The accident and personal injury record was very good in 1953, with a severity rating of .767 as compared with .822. In spite of a decrease in severity rating, the overall excellent record for all Company underground properties caused the Cambria-Jackson mine to slip from number two position rating in 1952 to number five position rating in 1953.

The following is a list of the number of compensable accidents classed as lost-time, where seven or more calendar days were lost by the employee through injury:

	<u>1953</u>	<u>1952</u>	<u>1951</u>	<u>1950</u>	<u>1949</u>
Fatal	0	0	0	1	0
Time lost - over 4 months	0	1	1	0	1
Time lost - 1 to 4 months	4	1	0	2	5
Time lost - less than 1 month	3	1	1	2	5
Total compensable accidents	7	3	2	5	11

On December 31, 1953, payments were being made on four cases which occurred prior to January 1, 1953. Three are death claims, and one occupational disease claim is being paid.

Accident statistics and details of all accidents are listed below:

<u>Acc. No.</u>	<u>Date of Accident</u>	<u>Name</u>	<u>Injury</u>	<u>Days Lost</u>
96	1-30-53	Lloyd Spencer	Contused back and knee. Fractured bone in foot.	19

While helping partner drill, a fall of ground knocked him down.

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10. ACCIDENTS AND PERSONAL INJURY (CONTINUED)

Detail of Accidents (Continued)

<u>Acc. No.</u>	<u>Date of Accident</u>	<u>Name</u>	<u>Injury</u>	<u>Days Lost</u>
97	2-10-53	Leonard Stone	Fracture, right arm.	70

The injured employee was feeling the under side of the conveyor to see if it was dry. His unbuttoned overall sleeve got caught in the idler and pulled his hand and forearm through, between the belt and idler.

98	6-24-53	Ronald Kivisto	Contusion, right thumb.	10
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Helping to unload bundled lagging from the cage on the 7th level, and squeezed his right thumb between the lagging and the cage.

99	9-3-53	Donald Demmer	Sprain, left hand.	14
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Bruised and squeezed left hand, when caught between stopper board and side of car.

100	10-14-53	John Paavola	Severe laceration and fracture, left ring finger.	40
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Finger was caught between a dropped piece of steel and a drawhead, while injured employee was helping to unload steel from a timber truck.

101	11-11-53	Leslie Kompsi	Laceration, forehead. Contusions of neck. Concussion.	33
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A chunk of ore fell from the stope, bounced off a cap, and struck injured employee in forehead and neck.

102	12-30-53	Carl Austin	Fracture, right ankle.	Home
-----	----------	-------------	------------------------	------

Carl Austin and his partner were standing on the ore pile, getting ready to blast a large chunk of ore. His partner noticed a small chunk starting to roll. He warned Austin, who moved down the pile into the path of the rolling chunk. He was struck on the inside of the right leg. At the end of the year, this employee was still home.

11. POWER

A fixed minimum charge of \$.041 per K. W. H. is charged for the 15-minute demand x 72 K. W. H., or approximately 80,000 K.W.H. at the minimum rate. A charge of \$.0096 per K. W. H. is made for any power consumed over the minimum rate. To the above charges, an additional charge is made based on the cost of operating the steam and diesel plants, which is listed as a fuel adjustment.

The following is a comparison of the power cost:

<u>Year</u>	<u>K.W.H.</u>	<u>Cost</u>	<u>Rate</u>
1953	4,579,200	\$78,251.09	\$.01709
1952	4,676,800	\$77,474.04	\$.01657

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1. GENERAL

The Maas Mine operated on a schedule of two 8 hour shifts, five days per week throughout the year. In addition there was a small crew of trammers, skip tenders, and hoistmen on the midnight shift to pull the ore which accumulates on the preceding two shifts. This is particularly necessary in the wet areas where an accumulation of ore could result in a mud run below the loading chute. It is also desirable to draw ore from the block cave areas in order to keep each of the mills running properly.

The labor turnover amounted to approximately 14% as compared to 10% for the preceding year. The number of men employed at the end of the year was 16 less than at the start representing a 4% loss in employment. By agreement in 1952 there was an increase to the standard hourly wage rates of 8½ cents per hour, which became effective on June 12, 1953. Also, effective July 1, 1953 there was an increase of 1 cent to the increment between job classes raising the total increment to 5½ cents. This had the effect of submerging many of our existing incentive rates and the company revised the incentives upward to keep them effective.

The total production for the year amounted to 587,016 tons, which exceeded the original estimated budget by approximately 44,000 tons. The average grade on output was well within the guarantee. The greatest proportion of the production continued to come from the 6th Level, with smaller amounts from 4th, 5th, and 7th Levels. During the last half of the year many of the small mining areas above the 5th and 6th Levels were exhausted, requiring a transfer of men to 7th Level where block caving development is under way. By the end of the year the 7th Level was producing up to 25% of the total product.

Development during the year was confined almost entirely to the 7th Level, totaling 1,742 feet. The 700 Drift located along the south side of the ore body was driven west to the Pioneer and Arctic boundary line. The 7000 Drift which is in the north footwall was also continued to the west and will be extended to the Pioneer and Arctic boundary line with the necessary Crosscuts connecting to the 700 Drift to the south.

A major drilling program was under way late in the year to outline the western extension of the Maas ore body going into the Pioneer and Arctic property. Two holes were completed on the 2700' west coordinate and indications are that the section of ore is essentially the same as indicated on the 2300' west coordinate where the last well defined crosssection was made. The geological information gained from 7th Level development and diamond drilling indicates a leveling off and even a possible rise in the bottom of the ore trough. If this should continue for some distance, and the ore thickness remain the same, it is probable that the 7th Level will produce more ore than originally estimated.

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2. PRODUCTION

a. Production by grades and Months

<u>Month</u>	<u>Maas</u>	<u>Race Course</u>	<u>Total</u>	<u>Rock</u>
January	35,721	11,140	46,861	1,615
February	33,432	11,270	44,702	995
March	40,592	9,915	50,507	1,470
April	45,142	10,050	55,192	1,765
May	39,413	10,874	50,287	2,515
June	40,228	11,028	51,256	2,590
July	44,497	6,473	50,970	2,645
August	31,669	5,107	36,776	1,675
September	33,833	7,627	41,460	2,905
October	42,269	3,603	45,872	2,655
November	33,859	3,916	37,775	2,505
December	40,255	3,938	44,193	2,010
<b>Total</b>	<b>460,910</b>	<b>94,941</b>	<b>555,851</b>	<b>25,345</b>
Stockpile Overrun	27,463	3,702	31,165	- - -
<b>Grand Total</b>	<b>488,373</b>	<b>98,643</b>	<b>587,016</b>	<b>25,345</b>

The Product was distributed by leases as follows:

	<u>1953</u>	<u>1952</u>
George Maas Lease	466,756	407,942
Race Course Lease	98,643	89,925
Baldwin Kiln Road	21,617	- - -
<b>Total Ore</b>	<b>587,016</b>	<b>497,867</b>
<b>Rock</b>	<b>25,345</b>	<b>35,815</b>
<b>Total Hoist</b>	<b>612,361</b>	<b>533,682</b>

b. Shipments

<u>Grade of Ore</u>	<u>Pocket Tons</u>	<u>Stockpile Tons</u>	<u>Total Tons</u>	<u>Total Last Year</u>
Maas	221,313	229,205	450,518	406,034
Race Course	47,118	64,463	111,581	80,326
<b>Total</b>	<b>268,431</b>	<b>293,668</b>	<b>562,099</b>	<b>486,360</b>
<b>Total Last Year</b>	<b>141,077</b>	<b>345,283</b>	<b>486,360</b>	<b>- - -</b>
<b>Increase</b>	<b>127,354</b>		<b>75,739</b>	
<b>Decrease</b>		<b>51,615</b>		



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2. PRODUCTION - Continuedc. Ore Statement

	<u>Maas</u>	<u>Race Course</u>	<u>Total</u>	<u>Total Last Year</u>
On Hand 1-1-53	55,700	19,425	75,125	63,618
Product for Year	460,910	94,941	555,851	497,867
Overrun	27,463	3,702	31,165	- - -
<b>Total</b>	<b>544,073</b>	<b>118,068</b>	<b>662,141</b>	<b>561,485</b>
<b>Shipments</b>	<b>450,518</b>	<b>111,581</b>	<b>562,099</b>	<b>486,360</b>
Balance on Hand	93,555	6,487	100,042	75,125
Increase in Output	52,968	5,016	57,984	- - -

Schedule of Operations 1949 - 53

<u>Days</u>	<u>Shifts</u>	<u>Hours</u>	
6	2	8	1-1-49 to 6-26-49
5	2	8	6-27-49 to 8-26-50
6	2	8	8-26-50 to 5-18-52
5½	2	8	5-19-52 to 11-16-52
5	2	8	11-17-52 to 12-31-53

d. Division of Product by Levels

	<u>1953</u>	<u>%</u>	<u>1952</u>	<u>%</u>
Fourth Level	133,087	22.7	107,143	21.5
Fifth Level	47,429	8.1	96,869	19.5
Sixth Level	320,626	54.6	284,980	57.2
Seventh Level	85,874	14.6	8,875	1.8
<b>Total</b>	<b>587,016</b>	<b>100.0</b>	<b>497,867</b>	<b>100.0</b>

e. Production Delays

	<u>Tons Lost</u>
March 20th - 4 Hours - skip roller broken off	250
August 10th, 10:00 PM, - to August 11th, 11:00 PM - spiders became loose on the main shaft of skip hoist	2,400
<b>Total Loss</b>	<b>2,650</b>

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3. ANALYSIS

a. Average Mine Analysis on Output

<u>Grade</u>	<u>1953</u>				<u>1952</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	57.99	.104	8.85	.183	58.30	.109	9.10	.158
Race Course	58.22	.098	8.17	.230	58.54	.093	8.97	.234

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 & Race Course	57.60	.109	9.38	0.22	3.51	0.72	0.33	.168	2.23	12.70

c. Average Natural Analysis of Ore in Stock - December 31, 1953

<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	93,555	50.64	.094	7.94	0.21	2.92	0.74	0.35	.189	1.92	12.70
Race Course	6,487	50.78	.089	7.33	0.21	3.18	0.74	0.31	.260	1.92	12.80

d. Straight Cargo Shipments

	<u>Tons</u>	<u>Iron</u>	<u>Phos</u>	<u>Sil.</u>	<u>Sul.</u>	<u>Moist.</u>
Dried	29,796	57.86	.102	9.02	.174	12.53

4. ESTIMATE AND ANALYSIS OF ORE RESERVES

The proven ore reserves, as reported to the Tax Commission, showed approximately 315,000 tons added to that category after production for the year was deducted. The bulk of this tonnage was gained at the western end of the 7th Level where development of Block #2 outlined the footwall contact. The ore in this area was formerly in the "Probable" category. Some new ore was found at the south end of the 6100 Crosscut pillar as the sub level development extended the ore contact beyond that previously assumed.

The reserves above 5th Level showed a decrease beyond that of production as some ore was left unavoidably along the very flat footwall and was considered unavailable after the contracts completed mining operations in these areas.

The drilling program being carried out at the end of the year was transferring more tonnage to the Proven Reserves from the Probable, although such ore is not considered in the following table as complete information was not yet available. In addition, it is expected that the limit of ore considered "Probable" will be extended to the west as a result of the same program.

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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>Total Mine</u>
Reserves 12-31-52	3,722,649	330,106	31,538	4,084,293
Produced 1953	466,756	98,643	21,617	587,016
Former Reserves 12-31-53	3,255,893	231,463	9,921	3,497,277
Reserves 12-31-53 (Based on report to the Tax Commission)	3,562,622	237,342	12,126	3,812,090
Developed Ore	306,729	5,879	2,205	314,813

Expected Average Natural Analysis of Ore Reserves

(Based on report to Tax Commission 12-31-53)

<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	3,574,747	51.00	.092	8.10	0.18	2.45	0.57	.120	.200	1.43	13.50
Race Course	237,342	51.00	.092	8.10	0.18	2.45	0.57	.120	.200	1.43	13.50