

TILDEN MINE
ANNUAL REPORT
YEAR - 1943

7. OPEN PIT
OPERATIONS (CONT.)

F. Drilling, Blasting & Explosives (Cont.)

2. Blasting (Cont.)

STATEMENT OF COST OF EXPLOSIVES USED FOR YEAR
ENDING DECEMBER 31, 1943

Primary Blasting

<u>KIND</u>	<u>Quantity</u>	<u>Price</u>	<u>Amount</u>
Hercomite 7 $\frac{1}{2}$ x 24.....	7,191 lbs.	\$ 10.50	\$ 755.06
E.P. #85..7 $\frac{1}{2}$.x.24.....	14,100 lbs.	11.00	1,551.00
Gelatin Extra 7 $\frac{1}{2}$ x 24....	150 lbs.	12.75	19.12
Total Powder.....	21,441 lbs.	10.84	2,325.18

Blasting Supplies

Primacord Bickford Fuse, regular	1,000 feet	32.00	32.00
Primacord Bickford Fuse, wire bound.....	1,000 feet	40.50	40.50
Total Blasting Supplies..			72.50

Total All Explosives..... \$ 2,397.68

Total Ore Blasted in 1943.....	51,046
Tons of Ore per lb. of Powder...	2.38
Cost per ton for Powder.....	\$.0455
Cost per ton for Blasting Supplies	.0013
Cost per ton for all Explosives.	.0468
Average price per lb. for Powder	.1084

Secondary Blasting

<u>KIND</u>	<u>Quantity</u>	<u>Price</u>	<u>Amount</u>
60% Gelatin.....	1,575 lbs.	\$ 11.50	\$ 181.12
Total Powder.....	1,575 lbs.	\$ 11.50	\$ 181.12

Blasting Supplies

Clover Fuse.....	3,920 feet	5.15 M	20.19
#6 Blasting Caps.....	1,000	12.20 M	12.20
#7 Wire Lighters.....	400	6.75 M	2.70
Total Blasting Supplies..			35.09

Total All Secondary Explosives \$ 216.21

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7. OPEN PIT
OPERATIONS (CONT.)

f. Drilling, Blasting & Explosives (Cont.)

2. Blasting (Cont.) (Secondary)

Product.....	139,991
Pounds of Powder per ton of Ore.....	.011
Cost per ton for Powder.....	.0013
Cost per ton for Fuse, Caps, etc.....	.0003
Cost per ton for All Explosives.....	.00155
Average Price per lb. for Powder.....	.1150

COMBINED TOTAL BLASTING COSTS

<u>Kind</u>	<u>Quantity</u>	<u>Price</u>	<u>Amount</u>
Hercomite 7 $\frac{1}{2}$ " x 24".....	7,191 lbs.	\$ 10.50	\$ 755.06
E.P. #85 7 $\frac{1}{2}$ " x 24".....	14,100 lbs.	11.00	1,551.00
Gelatin Extra, 7 $\frac{1}{2}$ "x24".....	150 lbs.	12.75	19.12
60% Gelatin.....	1,575 lbs.	11.50	181.12
Total Powder.....	23,016 lbs.		\$2,506.30
 <u>Blasting Supplies</u>			
Primacord Bickford Fuse, Regular.....	1,000 feet	32.00 M	32.00
Primacord Bickford Fuse, Wire Bound.....	1,000 feet	40.50 M	40.50
Clover Fuse.....	3,920 feet	5.15	20.19
#6 Blasting Caps.....	1,000	12.20	12.20
#7 Hot Wire Lighters.....	400	6.75	2.70
Total Blasting Supplies			107.59
TOTAL ALL EXPLOSIVES			2,613.89

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7. OPEN PIT
OPERATIONS (CONT.)

f. Drilling, Blasting & Explosives (Cont.)

3. Statement of Cost of Drilling and Blasting 51,046 Tons of Ore in the
First and Second Benches, East Pit

Net feet of Holes Drilled - 1,535 Feet

<u>Drilling Cost</u>				Cost	Cost
<u>Operating</u>	<u>Labor</u>	<u>Supplies</u>	<u>Total</u>	<u>Per Foot</u>	<u>Per Ton</u>
Drilling at Mine	\$ 1,180.10	\$ 113.87	\$ 1,293.97	.907	
Sharpening Bits	281.63	196.95	478.58	.312	
Pipe and Fittings		273.64	273.64	.113	
New Bits		283.30	283.30	.184	
New Tools		172.71	172.71	.112	
New Rope		52.45	52.45	.034	
Electric Power		128.22	128.22	.083	
Trucks and Tractor	145.98	43.36	189.34	.123	
Total Operating	\$ 1,607.71	\$ 1,264.50	\$ 2,872.21	1.868	
<u>Maintenance</u>					
Drill Maintenance	48.07	10.41	58.48	.038	
Drill Sharpener Equipment					
Total Maintenance	48.07	10.41	58.48	.038	
Total Maintenance and Operating	\$ 1,655.78	\$ 1,274.91	\$ 2,930.69	1.906	.057
<u>Primary Blasting Costs</u>					
Labor Loading Holes	192.48		192.48		
Explosives		2,397.68	2,397.68		
Other Supplies		14.49	14.49		
Total Blasting Costs	192.48	2,412.17	2,604.65		.057
Grand Total, Operating, Maintenance, and Primary Blasting Costs.....	\$ 1,848.26	\$ 3,687.08	\$ 5,535.34		.108

g. Loading Operations

Loading from the stockpiles started on April 26th and from the pits on May 18th. The pits were shut down on October 30th and the last shipment made from the stockpile on November 11th.

There was no activity in the Lower Bench West Pit this year, all production being made from both halves of the West Pit main bench and the two benches of the East Pit.

A small amount of broken ore remains in the West portion of the West Pit and no further reserves in that area exist. The East half of the West Pit was stripped during 1943 to afford considerable more tonnage from the main bench elevation; with the bulk of ore to be obtained from the Lower Bench. The No. 52 shovel worked the entire season in the West Half and the No. 29 divided activities between stripping and ore loading in the East Half.

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7. OPEN PIT
OPERATIONS (CONT.)

g. Loading Operations (cont.)

In the East Pit area, both Benches were put in ore production, this being the first for the Second Bench. Upon the completion of the haulage road to the higher bench late in the season, a small tonnage was moved down by trucks. The No. 46 shovel did considerable casting from the Second Bench to the bottom level prior to the completion of the haulage road, providing excellent loading conditions for the No. 31 shovel in the main bench. It was possible in meeting Low Phos. ore requirements to move the No. 46 down to the main bench during the season and load out on the Euclid trucks.

The localities and shifts worked by the power shovels during the season are noted below:

<u>Unit</u>	<u>Shifts</u>	<u>Locality</u>
No. 52 Shovel	40	Loading ore West Half West Pit
	12	Stripping Lower Bench West Pit
	4	Loading from stockpiles
No. 29 Shovel	22	Loading ore East Pit
	26	Casting on Second Bench East Pit
	20	Stripping East Pit
No. 31 Shovel	53	Loading ore in East Pit
No. 29 Shovel	22	Loading ore in East Half of West Pit
	120	Stripping East end of West Pit

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8. COST OF
OPERATING

a. Comparative Mining Costs

	<u>1943</u>	<u>1942</u>	<u>Increase</u>	<u>Decrease</u>
Production.....	139,991	235,207		95,216
Average Daily Output....	1,718	1,680	38	
Tons per man per day....	45.38	47.01		1.63
Number of days operating	81 $\frac{1}{2}$	140		58 $\frac{1}{2}$
Number of shifts and hours	45 $\frac{1}{2}$	91-1-8 hr.		45 $\frac{1}{2}$
		11-3-8 hr.		11
	18	8-2-8 hr.	10	
<u>Cost</u>				
Stocking and Loading Ore *	.001	.019		.018
Pit Operating Accounts..	.343	.358		.015
Pit General Accounts....	.073	.053	.020	
Cost at Mine.....	.417	.430		.013
Idle and Winter Expense..	.207	.144	.063	
Total Cost at Mine..	.624	.574	.050	
<u>Depreciation</u>				
Plant and Equipment.....	.123	.084	.039	
Taxes.....	.056	.030	.026	
Stripping.....	.020	.016	.004	
Grand Total Cost at Mine	.823	.704	.119	
<u>Expense Beyond Mine</u>				
Freight - Rail.....	.650	.650		
Lake Freight.....	.860	.860		
Cargo Insurance and Analysis	.011	.011		
Shrinkage.....	.015	.013	.002	
TOTAL COST LOWER LAKES	2.359	2.238	.121	

* No ore stocked in 1943.

The increase of \$.012 per ton is attributed chiefly to the Idle & Winter, Depreciation of Plant and Equipment, and Taxes. The Idle & Winter expenses of repairing equipment, although incurred in the first three months of this year are a direct result of the wear caused by the much larger output in 1942. The very small output of 1943 had to bear a disproportionately higher expense for this repair work.

An increase in the unit cost, as shown in Depreciation of Plant and Equipment, is due to the higher charges allocated to Depletion of Original Cost.

The increase in the unit cost attributed to Taxes is similar to the Idle and Winter charges, inasmuch as the low 1943 output bore the high assessment of the previous year.

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8. COST OF OPERATING (CONT.)

b. Detailed Cost Comparison (Cont.)

4. Open Pit Costs

	<u>1943</u>	<u>1942</u>	<u>Increase</u>	<u>Decrease</u>
Shifts and Hours.....	45½ - 1-8 hr.	91 - 1-8 hr.		46½
	---	11 - 3-8 hr.		11
	18 - 2-8 hr.	8 - 2-8 hr.	10	
Production Tons.....	139,991	235,207		95,216
Average Product Per 8 hr. Shift.....	1,718	1,680	38	
Number of Shifts Worked....	81½	140		58½

	<u>PIT OPERATIONS</u>		<u>1943</u>		<u>1942</u>		<u>Increase</u>		<u>Decrease</u>	
	<u>Direct Ore</u>	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>	
1. Drilling and Blasting.....	\$15,013.37	.107	\$31,007.22	.133	\$		\$15,993.85	.026		
2. Power Shovels Operating.....	4,900.52	.036	8,462.47	.036			3,561.95	.000		
3. Power Shovels Maintenance.....	2,331.46	.017	4,532.42	.019			2,200.96	.002		
4. Locomotives & Cars Operating.....	5,069.23	.036	7,860.80	.033	.003		2,791.57	.000		
5. Locomotives & Cars Maintenance.....	265.34	.002	437.90	.002			172.56	.000		
6. Track Expense.....	2,858.00	.020	2,879.57	.012	.008		21.57			
6A. RD. Tractor Operating.....	164.22	.001	913.63	.004			749.41	.003		
6B. RD. Tractor Maintenance.....	183.75	.001	728.19	.003			544.44	.002		
7. Euclid Trucks Operating.....	449.30	.003	1165.01	.005			715.71	.002		
7A. Euclid Trucks Maintenance.....	345.45	.003	60.38	.000	285.07	.003				
TOTAL DIRECT ORE	\$31,580.64	.226	\$58,047.59	.247	285.07	.014	\$26,466.95	.021		
<u>General Pit Expense</u>										
8. Water Supply.....	\$ 39.31	.000	\$ 54.65	.000			\$ 15.34	.000		
9. Buildings.....	108.46	.001	1,887.51	.008			1,779.05	.007		
10. Crushing and Screening.....	9,548.24	.068	15,669.70	.066	.002		6,121.46			
11. General Open Pit Expense.....	5,062.43	.036	6,751.94	.029	.007		1,689.51			
13. Open Pit Supts.....	1,655.88	.012	1,683.60	.007	.005		27.72			
14. Waste Pile Expense.....	---	---	127.03	.001	---		127.03	.001		
TOTAL GENERAL EXPENSE.....	16,414.32	.117	26,174.43	.111	.006		9,760.11	---		
TOTAL PIT OPERATION.....	\$47,994.96	.343	84,222.02	.358	---		36,227.06	.015		
Stocking Tilden Crushed Ore.....	---	---	3,093.89	.013	---		3,093.89	.013		
GRAND TOTAL.....	\$47,994.96	.343	\$87,315.91	.371	---		39,320.95	.028		

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8. COST OF OPERATING (CONT.)

b. Detailed Cost Comparison (Cont.)

4. Open Pit Costs (Cont.)

<u>GENERAL MINE EXPENSE</u>	<u>1943</u>		<u>1942</u>		<u>Increase</u>		<u>Decrease</u>	
	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>
16. Mining Engineering.....\$	947.64	.007	\$ 901.15	.004	\$ 46.49	.003	---	---
16A. Geological.....	57.74	.000	22.91	.000	34.83	---	---	---
17. Mechanical and Electrical Engineering..	91.85	.001	144.05	.001	---	---	\$ 52.20	.000
18. Analysis & Grading.....	2,679.88	.020	4,056.62	.016	---	.004	1,376.74	---
19. Safety Department.....	85.03	.001	107.28	.001	---	---	22.25	.000
20. Local & Gen. Welfare....	136.00	.001	234.00	.001	---	---	98.00	.000
21. Special Expense.....	469.73	.003	374.36	.002	95.37	.001	---	---
22. Ishpeming Office.....	538.00	.004	860.00	.004	---	---	322.00	.000
23. Mine Office.....	1,875.14	.013	2,043.51	.008	---	.005	168.37	---
24. Insurance.....	168.85	.001	188.31	.001	---	---	19.46	.000
25. Personal Injury.....	741.66	.005	370.66	.002	371.00	.003	---	---
26. Social Security Taxes...	692.48	.005	1,114.27	.005	---	---	421.79	.000
27. Employees Vacation Pay..	1,743.74	.012	1,941.17	.008	---	.004	197.43	---
TOTAL GENERAL MINE EXPENSE..	\$10,227.74	.073	12,358.29	.053		.020	2,130.55	
IDLE AND WINTER EXPENSE.....	28,982.68	.207	33,776.82	.144		.063	4,794.14	
COST OF PRODUCTION.....	\$87,205.38	.623	133,451.02	.568		.055	46,245.64	
28. Deprn. Plant & Equipt...	9,799.37	.070	17,129.11	.073			7,329.74	.003
28A. Deprn. Motorized Equipt.	3,219.79	.023	5,409.76	.023			2,189.97	.000
29. Amortization Stripping..	2,799.82	.020	4,704.14	.020			1,904.32	.000
30. Taxes.....	7,908.36	.056	7,139.38	.030	768.98	.026		
Amortization Development	418.20	.003	768.28	.003			350.08	.000
Depletion of Original Cost.....	3,687.63	.027	659.88	.003	3,027.75	.024		
COST AT MINE.....	115,038.55	.822	169,261.57	.720		.102	54,223.02	
Loading Stocked Ore.....	198.61	.001	1,494.19	.006			1,295.58	.005
Inventory Adjustment.....			17.71	.000			17.71	.000
TOTAL COST AT MINE.....	115,237.16	.823	170,773.47	.726		.097	55,536.31	

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8. COST OF
OPERATING (CONT.)

b. Detailed Cost Comparison (Cont.)

4. Open Pit Costs (Cont.)

1. Drilling and Blasting decreased cost due to Lower cost for Drilling and Blasting in 1942 and less secondary blasting required.
9. Buildings in 1942 - Garage was enlarged in 1942.
Idle and Winter Expense - see detailed explanation.
30. Taxes - Decrease of 95,211 tons in shipments which accounts for the increased cost per ton.

Several adjustments made by the Cleveland office to the 1943 Cost Sheet were received at the mine, February 28, 1944. These changes pertaining to the section "General Mine Expense" are given below:

<u>As Given in Mine Cost Sheet</u>	<u>As Adjusted by Cleveland</u>	<u>Net Adjustment</u>
21. Special Expense \$ 469.73	\$ 339.41	\$ 120.32 decrease
22. Ishpeming Office 538.00	453.57	84.43
26. Social Security Taxes 692.48	632.53	59.95
Idle & Winter Expense 28,982.68	26,710.93	2,271.75

The total net adjustment amounts to a decrease of \$2,536.45, or \$.018 per ton. These adjustments have not been made in this report to the individual cost sheets affected. The cost sheets reflecting the ultimate reduction on cost per ton basis are:

- | | |
|--|---|
| <ol style="list-style-type: none"> 5. Labor and Wages 8. Cost of Operating | <ol style="list-style-type: none"> b. Comparative Statement of Wages & Products a. Comparative Mining Costs b. Detailed Cost Comparison <ul style="list-style-type: none"> General Mine Expense - Idle & Winter Expense Idle & Winter Expense Detail Sheets |
|--|---|

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8. COST OF OPERATING (CONT.)b. Detailed Cost Comparison4. Open Pit CostsIdle and Winter Expense

	<u>Labor</u>	<u>Supplies</u>	<u>Total</u>
January	\$ 2,648.23	\$ 1,273.90	\$ 3,922.13
February	3,183.20	2,939.00	6,122.20
March	3,300.01	1,322.22	4,622.23
April	5,889.30	1,398.41	7,287.71
November	2,541.82	1,123.27	3,665.09
December	2,933.89	429.43	3,363.32
Actual	\$ 20,496.45	\$ 8,486.23	\$ 28,982.68

Idle and Winter Expense Detail

<u>Direct Ore</u>	<u>1943</u>	<u>1942</u>	<u>Increase</u>	<u>Decrease</u>
Drilling and Blasting	\$ 193.43	\$ 154.47	\$ 39.96	
Power Shovels Maintenance	5,755.29	7,041.96		\$ 1,286.67
Locomotives & cars maintenance	1,386.93	1,819.33		432.40
Track Expense	523.00	628.85		105.85
RD Tractor Maintenance	742.16	2,273.32		1,531.16
Euclid Trucks Maintenance	120.55	45.63	74.92	
Total Direct Ore	8,721.36	11,964.56		3,243.20
Water Supply	3.16	36.73		33.57
Buildings	106.02	116.37		10.35
Crushing and Screening	6,477.13	9,504.40		3,027.27
General Open Pit Expense	5,429.81	4,862.88	566.93	
Open Pit Superintendent	1,372.50	1,045.40	327.10	
Waste Pile Expense		138.77		138.77
Total General Pit Expense	13,388.62	15,704.55		2,315.93
Total Pit Operating	22,109.98	27,669.11		5,559.13
Mining Engineering	422.92	522.12		99.20
Mechanical & Elect. Engr.	25.94	68.61		42.67
Analysis and Grading	681.32	1,851.08		1,169.76
Safety Department	49.62	50.33		.71
Special Expense	2,467.17	268.41	2,198.76	
Ishpeming Office Expense	503.20	359.99	143.21	
Local and General Welfare	102.59	81.45	21.14	
Mine Office Expense	1,870.42	1,851.84	18.54	
Insurance Property, etc.	167.40	101.37	66.03	
Personal Injury Expense	133.67	372.10		505.77
Social Security Taxes	650.17	574.65	75.62	
Geological	47.44	6.96	40.48	
Total General Mine Expense	6,854.54	6,108.71	745.83	
Total Cost of Mining	28,964.52	33,777.82		4,813.30
Inventory Loss	18.16		18.16	
TOTAL COST	\$ 28,982.68	33,777.82		4,795.14

The charges for Idle and Winter Expense are disproportionately higher for the 1943 season with a low production as compared to the previous higher production year. The 1943 cost sheet carries approximately one-half of the repair charges against equipment worn as a result of the high tonnage output of 1942.

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8. COST OF OPERATING (CONT.)

b. Detailed Cost Comparison (Cont.)

4. Open Pit Costs (Cont.)

Idle and Winter Expense (Cont.)

The Idle and Winter Expense includes the amount of \$3,023.10 - adjustment of wages for period from July 13, 1942 to March 31, 1943.

The adjustment is as follows:

Drilling and Blasting.....	\$.75
Power Shovels Maintenance.....		235.18
Locomotives and Cars Maintenance.....		95.42
Track Expense.....		5.26
Maintenance Rd. Tractor.....		38.32
Maintenance Euclid Trucks.....		2.25
Buildings.....		3.75
Crushing and Screening.....		187.09
General Open Pit Expense.....		<u>183.33</u>
TOTAL.....	\$	751.35 *

*This amount was charged to Idle and Winter Expense Cost Sheet for the month of April, 1943.

Mine Payroll.....		713.48
General Storehouse Payroll.....		<u>37.87</u>
TOTAL.....	\$	751.35

Above adjustment prorated on January, February and March, 1943 Labor Charges.

Amount of Wages adjustment from July 13, 1942 to Dec. 31, 1942

Mine Payroll.....		2,195.40
General Storehouse Payroll.....		<u>76.35</u>
TOTAL.....	\$	2,271.75 *

* Charged to Special Expense - Idle and Winter Expense.

GRAND TOTAL WAGE ADJUSTMENT..... \$ 3,023.10

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10. TAXES

Tilden Township
Tilden Mine

	<u>1943</u>		<u>1942</u>	
	<u>Valuation</u>	<u>Taxes</u>	<u>Valuation</u>	<u>Taxes</u>
N $\frac{1}{2}$ of Sec. 26, 47-27.....	335,000.	6,397.73	270,000.	5,228.90
Personal Supplies & Equip..	75,000.	1,432.33	95,000.	1,839.80
Total.....	410,000.	7,830.06	365,000.	7,068.70
Collection fees.....		78.30		70.68
Total Tilden Mine..	410,000.	7,908.36	365,000.	7,139.38

The small production of 1943 had to bear the costs of a high valuation set the previous year.

11. PERSONAL INJURY

There were no lost time accidents at the Tilden Mine during the year 1943.

12. NEW CONSTRUCTION
AND PROPOSED
NEW CONSTRUCTION

Construction of the haulage road to the Second Bench East Pit was completed. In October, an asphalt surfacing was given the haulage road and the immediate approach to the mine office and shops. The Second Bench is now in a productive stage.

When completed, the stripped area in the East Half of the West Pit will include the present location of the main approach to the mine. Disposition of the overburden was made as fill for a new approach which provided in addition to its immediate use as a road, a readily accessible waste dump closer to the stripping area than the previously used dump. Additional fill was made as an extension to the road in the form of a dike so that the entire structure would serve as a dam to impound water necessary for washing of stripped areas. It may be possible, in the future, to obtain all water necessary for the operation from this source and thereby eliminate the necessity of carrying piping from the present source below the mine with its undesirable feature of crossing tracks, roads and workings to stripped areas above the pits proper.

In addition to the above mentioned construction, the road to the East Pit was widened and graded to serve as a truck haulage route to supplement locomotive and car haulage in Low Phos. production.

13. EQUIPMENT
AND PROPOSED
NEW EQUIPMENT

At the close of operations this year, it could be stated with confidence that the property was in shape to produce 600,000 tons per season. Stripping and development programs have been carried out sufficiently in advance and in coordination with loading requirements to economically provide material assistance to present loading activities in the form of truck haulage roads and readily accessible ore faces.

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13. EQUIPMENT
AND PROPOSED
NEW EQUIPMENT (CONT.)

With a growing increase in the efficiency of the output, per shift, the inadequacy of the present crusher system is strongly manifested. Mixing of ore from both pits is necessary to maintain grade guarantees and in doing so, a production of four grades of ore is actually made. Higher grade ore is obtained from the East Half and the Lower Bench West Pit, a medium grade from the West Half of the West Pit. In the East Pit, a lower grade Silica ore is obtained and also the Low Phosphorous type, the loading of which produces a reject tonnage of low iron silica ore termed Silica No. 1.

Daily analyses results frequently demand moves during a shift of either a shovel or of haulage units for qualitative reasons, or to provide compensating tonnage. It is necessary then, to work at least two shovels in Silica ore production for these reasons and the Traylor 42" primary crusher cannot accept the full production of the shovels. The remainder may be included at this point that the three Bucyrus shovels are equipped with 2 1/2 yard dippers and the Marion, a 2 yard dipper. A four yard dipper is standard for the No. 52 Shovel of the 120-B type. The small capacity dipper is designed, of course, to provide a finer feed for this crusher and chunks too large to pass through the bucket are not loaded on the haulage units. Despite this small size feed, the haulage units are constantly forced to await the clearance of the crushers. A speed-up in the primary crusher occurs when the concaves and mantle are worn, but this condition is immediately offset by choking of the resultant oversize feed to the two 10" secondary crushers.

The installation of larger crushing units would result in a tremendous gain in the daily output at this property, thus materially lowering operational costs.

Although the Second Bench of the East Pit has been established, it will not be possible, at present, to drill and shoot the First Bench without losing the Second Bench berm. It is the present intention to develop the Second Bench to provide a sufficient width of bench for activity, independent of the main bench. Using the small Marion No. 46 Shovel on this upper level, the two Euclid trucks should provide adequate haulage service.

The status of the West Pit main bench, however, is such that with the removal, by locomotive and cars, of a small broken ore pile of 20,000 tons in the West portion, the single remaining ore face will be a rapidly diminishing slope in the East Half. The topography of this East Half requires the drilling of a large number of shallow holes which is uneconomical, in that the logical procedure would be to recover that shallow area from the Lower Bench. At present, however, with rail haulage serving that area, it is necessary to break the shallow section to provide track access to the higher bank, which, in itself, is pinching out between a diorite mass and the shallow section. Viewed in its entirety, the East Half of the West Pit has a very short life and could now be worked profitably as a truck operation. It is necessary, at present, to work this face to provide a "sweetener" for the lower grade East Pit ores.

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13. EQUIPMENT
AND PROPOSED
NEW EQUIPMENT (CONT.)

The third ore face of the West Pit is the Lower Bench served by a 10% grade truck haulage road. This bench contains the higher iron content ores necessary to maintain shipping guarantees. During 1943, this bench was not worked, enabling the trucks to be used on the East Pit Second Bench. It is obvious that with any appreciable production requirement for the 1944 season, a shovel must be placed in that area. In that event, the two Euclid trucks will be entirely inadequate. A minimum of two trucks is necessary to efficiently service a shovel at this property, and with such an operation existent now in the Second Bench East and either or both shovels of the East Half and Lower Bench of the West Pit dependent on truck haulage, a five truck fleet would be required to sustain production. This would require the purchase of three additional units.

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18. NATIONALITY OF EMPLOYEES

	<u>American Born</u>	<u>Foreign Born</u>	<u>Total</u>
English.....	9	5	14
Swedish.....	3		3
Finnish.....	3	4	7
Irish.....	4		4
Total.....	19	9	28

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For purposes of record, the following remarks are included on the repair work done during the month of December, 1943:

No. 46 Electric Shovel - Marion 480

Repaired Boom and tightened up on propelling gears.

No. 31 Electric Shovel - Bucyrus-Erie 80 B

Changed bearings on generator set, repaired cab and welded rails on turntable.

No. 29 Electric Shovel - Bucyrus-Erie 80 B

Repaired and welded dipper, repaired boom, installed two new backing pinions and one idler sheave on Boom and thrust washer on propelling gears.

Crushing Plant

Dismantled and cleaned motors on both 10" crushers. Removed concaves from West 10" crusher and started to install new main frame on East 10" crusher.

JSW:el

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1. GENERAL:

The mine operated on a schedule of three shifts per day, five days per week and two shifts on Saturday from January 1st to February 1st, a total of 17 shifts per week. Starting the first week of February and continuing for the balance of the year the Saturday afternoon shift was discontinued thereby reducing the working schedule to 16 shifts per week.

Production in 1943 was 517,814 tons and was 163,934 tons less than in 1942. This large decrease was mainly due to a fire in the mine which made it necessary to abandon a large mining area above the 7th Level in Block 3. Development of new territory to replace the area lost on account of the fire continued throughout the year and is not yet completed. Production from newly opened areas is always less for a considerable time while a timber mat is being established. Other contributing factors causing the decrease in production were the loss of men due to the draft, to shifting of employees to the cities, transfer to other Company mines, to absenteeism especially on the midnight shift and to 47 less operating shifts due to discontinuing the Saturday afternoon shift for eleven months of the year.

Shipments decreased 150,379 tons in 1943, due to decrease in production, but were larger than in the years prior to the war. Ore from the Athens Mine is in demand for the Cliffs Group Mixture on account of its low silica content and all the ore in stock was removed in August, after which only wet ore was stocked. The wet ore was only a very small percentage of the product and it was not loaded by shovel.

On the evening of New Years Day, January 1, 1943, fire was discovered in the mine on the -635' Sub-level about 40 feet above the 7th Level. The area involved in this fire was 35 feet directly below the area where the mine fire occurred in June 1942. The new fire on the -635' Sub-level was probably caused by live embers from the fire area on the -610' Sub-level coming down along with a rock run. The only other possible cause would have been from spontaneous combustion. This area was inspected by two men on the previous evening after the mine had closed down for the New Years holiday and no evidence of fire was discovered, although rock was running in the breast of two slices. Immediate steps were taken to extinguish the fire. Trained fire fighting crews were called out and the fire would soon have been extinguished except for an unfortunate and unforeseen occurrence, a ventilation door near the top of the shaft between the cage and skip road just below surface opened and allowed the upcast air and smoke to short circuit into the down cast air way. The fan had been kept running to keep the smoke moving away from the fire and also to keep it out of the lower levels of the mine. When smoke started coming in with the fresh air the fire fighting crews had to leave the mine until this condition could be corrected. Valuable time was lost while searching for the origin of the smoke in the down cast air way with the result that the entire mine filled with smoke. By the time the mine was freed from smoke the fire had gained so much headway that it was impossible to extinguish it. It was then decided to seal the fire area and endeavor to smother the fire by cutting off the supply of oxygen. This work was started by the

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1. GENERAL: (CONT.)

trained helmet crews working three shifts per day under the supervision of Mr. A. J. Stromquist, Superintendent of the Safety Department, the Superintendent, and Assistant Superintendent of the mine, and the Mining Captain. Tight brattices were installed in two cross-cuts on the 7th Level and also in the air way connection to the 6th Level. These were later reinforced by concrete seals, several feet in thickness. The Bureau of Mines representative stationed at Duluth, Minnesota, was called by telephone and asked to bring the Bureau's equipment to the mine, equipment was also obtained from the North Range Mining Company, and other operators. The Copper Range Company at Painesdale, Michigan, loaned a very sensitive motor driven carbon monoxide detector which was in constant use until one was obtained direct from the manufacturers. There were no injuries to the fire fighting crews which was a source of great satisfaction to the management. The mine was idle until January 12th when operations were resumed with a small crew on the 9th Level and on a portion of the 4th and 6th Levels. The air was tested several times on each shift for carbon monoxide gas as leakage of this deadly gas from the fire area through the timber mat was the greatest source of danger. Frequent samples were taken and analyses made of the air behind the various seals or brattices to determine the percentage of oxygen and carbon dioxide. There was a gradual decrease of oxygen and an increase of carbon dioxide gas indicating that in time the fire would be extinguished. The fire area was entered in March and active fire discovered on contact of fresh air with the charred wood. Additional work was done to make the seals tighter and a definite decision reached to abandon the fire area at least for several years. This will prevent a possible repetition of the fire and give the area an opportunity to cool below the dangerous temperature at which ignition occurs on contact with fresh air.

It was not possible to open sufficient new ore areas in 1943 to attain the monthly production made prior to the fire. A cave to surface above the North half of the 4th Level ore body would involve the Southeast Steel Trestle and stocking grounds which limited the number of sub-levels that could safely be mined in this area. Additional areas had to be opened for mining as rapidly as possible to replace this 4th Level area and as a consequence it was necessary to continue the development program all the year. In fact, it will be continued for most of the coming year. The 5th Level is being opened 100 feet above the 6th Level temporarily as a transfer level, as it does not connect to the shaft. After the war, this new level will be opened at the shaft and a connection driven to the part now being developed. To develop the 5th Level, it is necessary to develop the 6th Level under this territory, ^{and} put up a number of raises. By the end of the year, mining in Block 2 above the 9th Level was approaching the drifts on the level and it was necessary to start development of the 10th Level under this area. The above comments are made in explanation of the heavy development program the greater part of which was made necessary by the fire in the mine.

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1. GENERAL: (CONT.)

In December 1943, it was decided to resume mining in the West part of the pillar abandoned since the fire. This area extends from the -635' Sub-level above the 7th Level nearly down to the 8th Level. It is being developed by raises now being put up from a cross-cut on the 8th Level. An ore pillar 50 feet in width will seal off this area from the area involved in the fire. Mining here will reduce the tonnage temporarily abandoned on account of the fire from over 300,000 tons to approximately 100,000 tons. It will provide working places for at least two years for three contracts that will soon have to be transferred from the 4th Level.

Due to reduction in speed of the skip hoist from 1,750 feet per minute to about 1,300 feet per minute repairs of the steel sets and replacement of the skip guides in the circular part of the shaft was materially reduced and delays to hoisting largely eliminated. Equipment in the mine is showing the effect of the heavy operating schedule and repairs of motors, cars, haulage tracks, etc., was much heavier in 1943.

The area involved in the cave to surface extended further to the East in 1943 and also sunk six feet ore more in the Western two-thirds of the area. Three lots owned by private parties South of the area being mined was involved in the caving area due to cracks and settlement of surface material some distance South of the actual break in the rock formation. One of these properties was purchased and negotiations are underway for the purchase of the other two. Extension of the cave is inevitable as mining progresses to the East in the ore body above the 4th Level. Mining here will soon be confined to the South half of the ore area in order to prevent the cave extending North into the area used for stocking ore from the Southeast steel trestle.

The accident record in 1943 was excellent. There were no fatalities and only 25 compensable accidents, most of which caused only a short loss of time. The severity rate was considerably below the average for all of the mines operated by the Company, the frequency rate however was above the average.

2. PRODUCTION
SHIPMENTS AND
INVENTORIES:

a. Production by Grades:

	<u>1943</u>	<u>1942</u>	<u>Increase</u>	<u>Decrease</u>
Athens Ore	360,067	504,271		144,204
Mitchell Lease Ore	154,650	177,477		22,827
Corbit Lease Ore	3,097	-	3,097	
Total Ore	<u>517,814</u>	<u>681,748</u>		<u>163,934</u>
Rock	22,485	20,690	1,795	
Total Hoist	<u>540,299</u>	<u>702,438</u>	4,892	162,139

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YEAR 1943

PRODUCTION
SHIPMENTS AND
INVENTORIES: (CONT.)

b. <u>Shipments:</u>			<u>1943</u>	<u>1942</u>
	<u>Pocket Tons</u>	<u>Stockpile Tons</u>	<u>Total Tons</u>	<u>Total Tons</u>
<u>Grade of Ore</u>				
Athens Ore	227,392	133,366	360,758	500,910
Mitchell Lease Ore	100,546	57,445	157,991	171,315
Corbit Lease Ore	2,642	455	3,097	-
Total	330,580	191,266	521,846	672,225
Total Last Year	453,103	219,122	672,225	
Decrease	122,523	27,856	150,379	

Shipments decreased 22% in 1943 but were 4,032 tons more than the product for the year.

c. Stockpile Inventories:

<u>Grade of Ore</u>	<u>Dec. 31, 1943</u>	<u>Dec. 31, 1942</u>	<u>Decrease</u>
Athens Ore	42,103	42,794	691
Mitchell Lease Ore	14,545	17,886	3,341
Total	56,648	60,680	4,032

d. Division of Product by Levels:

	<u>1943</u>		<u>1942</u>	
	<u>Tons</u>	<u>Percent</u>	<u>Tons</u>	<u>Percent</u>
4th Level	174,418	33.7	135,564	19.9
6th Level	19,218	3.7	57,426	8.4
7th Level	112,852	21.8	327,023	48.0
8th Level	131,820	25.5	32,165	4.7
9th Level	79,435	15.3	129,570	19.0
10th Level	71	0.0		
Total	517,814	100.0	681,748	100.0

Production increased again from the 4th Level and in 1943 amounted to one-third of the total product. It also increased materially from the 8th Level. Decreases in product from the 6th and 9th Levels were due to decrease in the size of the ore bodies. The main decrease occurred on the 7th Level and was due directly to the fire in the mine.

e. Production by Months:

<u>Month</u>	<u>Athens</u>	<u>Mitchell</u>	<u>Corbit</u>	<u>Total</u>	<u>Rock</u>
January	17,415	7,782	-	25,197	935
February	24,412	13,980	-	38,392	2,480
March	31,455	14,528	-	45,983	1,140
April	31,198	12,701	1,129	45,028	1,955
May	29,577	12,280	1,436	43,293	1,485
June	33,635	12,718	532	46,885	3,085
July	34,098	11,403	-	45,501	2,000
August	34,359	14,854	-	49,213	1,500
September	30,527	15,059	-	45,586	1,720
October	31,225	12,373	-	43,598	1,835
November	28,056	12,112	-	40,168	1,615
December	29,312	11,949	-	41,261	2,735
Total 1943	355,269	151,739	3,097	510,105	22,485
Current Year's Stockpile Overrun	4,798	2,911	-	7,709	
Total 1943	360,067	154,650	3,097	517,814	22,485
Total 1942	504,271	177,477	-	681,748	20,690
Decrease	144,204	22,827		163,934	
Increase			3,097		1,795

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YEAR 1943

2. PRODUCTION,
SHIPMENTS AND
INVENTORIES: (CONT.)

f. Ore Statement:

	<u>Athens</u>	<u>Mitchell</u>	<u>Corbit</u>	<u>Total</u>	<u>Total 1942</u>
On Hand Jan. 1, 1943	42,794	17,886		60,680	51,157
Product for Year	355,269	151,739	3,097	510,105	678,900
Prior Years stockpile overrun	4,798	2,911		7,709	2,848
Total	402,861	172,536	3,097	578,494	732,905
Shipments	360,758	157,991	3,097	521,846	672,225
Balance on Hand	42,103	14,545	-	56,648	60,680
Decrease in Output				168,795	
Decrease ore on hand				4,032	

g. Delays:

January 2nd through January 11th - Loss of Product 15,810 tons

Due to the re-occurrence of the fire which was discovered on January 1st it was necessary to close the entire mine to production. On January 12th it was possible to reopen a portion of the mine not affected by the fire.

February 24th - 5 Hours Delay - Loss of Product 250 tons

Due to excessive wear in the sheave wheel groove it was necessary to change the skip head frame sheave before the regular week-end period.

April 22nd - 3 Hours Delay - Loss of Product 250 tons

A broken skip runner was discovered during the bi-weekly inspection which had to be repaired immediately.

May 3rd - 4 Hours Delay - Loss of Product 300 tons

As a result of the continuous vibration as well as corrosion, the main air line broke at a point immediately below surface at the shaft.

June 3rd - 8 Hours Delay - Loss of product 540 Tons

Due to several broken sets near the skip pit in the North compartment resulting from the pressure of wet dirt in the 10th Level pocket only one skip could be used during the day shift.

June 8th - 11 Hours Delay - Loss of product 700 tons

During the daily rope inspection it was found that the North skip rope due to broken wires had to be changed immediately rather than wait for the week-end. Immediately following the changing of the rope it was necessary to cut off the stretched portion of the new rope.

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2. PRODUCTION,
SHIPMENTS AND
INVENTORIES: (CONT.)

G. Delays: (Cont.)

January 21st - 2 Hours Delay - Loss of Product 150 tons

The main bearing of the South skip head frame sheave become over heated and it was necessary to install a water pipe to cool the bearing.

July 15th - 8 Hours Delay - Loss of Product 500 tons

During the regular shaft inspection a broken steel set was discovered in the skip compartment and had to be repaired before hoisting continued.

September 7th - 1½ Hours Delay - Loss of Product 110 Tons

There was a delay due to the needed repairs of plates in the 8th Level pocket.

October 23rd - 6 Hours Delay - No loss of Product

During the examination of the South skip rope it was found that further hoisting could not be carried on safely with the result that the rope was changed during the day shift. Hoisting was continued on the afternoon shift resulting in no loss of product.

October 26th - 1 Hour Delay - Loss of Product 100 tons

Due to a rock being wedged between the skip shoe and skip guide it was necessary to stop hoisting until it could be removed.

A summary of the delays in 1943 show a loss of 18,710 tons, most of which occurred between January 2nd and 11th inclusive, when the mine was idle due to the fire. This compares with a loss of 23,115 tons in 1942 due in large part to a breakdown of a motor in the engine house. Delays for repair of the skip roads were less in 1943 due to less ore hoisted and to reduction in speed of the skip hoist. Slower hoisting speed has almost entirely eliminated broken steel sets in the shaft and has materially reduced replacements of the skip guides.

h. Delays from Lack of Current:

May 5th - 3/4 Hour Delay - Loss of Product 60 tons

Due to an electric storm there was no current causing a three-quarter hour delay.

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3. ANALYSIS:

a. Average Mine Analysis on Output:

Grade	1943				1942			
	Tons	Iron	Phos.	Sil.	Tons	Iron	Phos.	Sil.
Athens	355,269	59.93	.113	7.62	504,271	60.18	.115	7.45
Mitchell	151,739	59.77	.111	7.49	177,477	60.22	.115	7.39

The average mine analysis of the output was lower in 1943 due to opening new areas for mining. Control of analysis is difficult on the three shift per day operating schedule and some dilution was inevitable in the new areas, opened directly under the Jasper hanging. The underlying cause was the fire in the mine.

b. Average Analysis on Straight Cargoes:

Grade	Mine	Lake Erie
Athens Ore	None	None
Mitchell Lease Ore	None	None

c. High Sulphur Ore:

No high sulphur ore was encountered in the mine during 1943. The ore mined on the Corbit Lease however was near the area where previous development encountered high sulphur ore but the sulphur did not exceed the average for the mine.

4. ESTIMATE OF ORE RESERVES:

a. Developed Ore:

Assumption: 12.75 Cubic feet equals one ton
10 percent for rock
10 percent for loss in mining
Percent of Bessemer - None.

	Athens Lots 1, 7, 10 & 12	Mitchell Lots 8, 9, 10	Corbit Lot 13	Total Tons
4th Level and above	587,080	324,283	502,380	1,413,743
4th Level to 6th Level	586,718	751,347	12,140	1,350,205
6th Level to 7th Level	85,604	124,008		209,612
7th Level to 8th Level	432,968	10,882		443,850
8th Level to 9th Level	359,078			359,078
9th Level to 10th Level	433,922			433,922
Below 10th Level	60,784			60,784
Total Gross Tons	2,536,154	1,210,520	514,520	4,261,194
Less 10% Loss in mining	253,615	121,052	51,452	426,119
	2,282,539	1,089,468	463,068	3,835,075
Less 10% for Rock	228,254	108,947	46,307	383,508
	2,054,285	980,521	416,761	3,451,567
Less Dec. Production	29,312	111,949		41,261
Net Tons 1943	2,024,973	968,572	416,761	3,410,306
Net Tons 1942	2,360,773	1,107,181	414,564	3,882,518
Decrease	335,800	138,609		474,409
Increase			2,197	2,197

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4. ESTIMATE OF ORE RESERVES: (CONT.)

a. Developed Ore:

There was a decrease of 472,212 tons in the estimated ore reserves in 1943, deducting this amount from the product of 517,814 tons shows that 45,602 tons were developed in 1943. Additional ore was developed above the 4th and 6th Levels during the year due to extension of ore beyond limits used in previous estimates. The ore in the pillar extending down to the footwall below the area adjacent to the fire on the -635' Sub-level is considered unavailable and has been omitted from this years estimate. Including this ore estimated to amount to over 300,000 tons would show approximately 350,000 tons developed in 1943 instead of the 45,600 tons shown above.

b. Prospective Ore:

All the ore in the mine is considered to be developed, however, as some additional ore is developed every year it is safe to assume that at least 500,000 tons can be added to the estimated ore reserves as probable ore.

c. Estimated Analysis:

	<u>Ore Reserves:</u> <u>Tons</u>	<u>Approximate Expected Natural Analysis:</u>									
		<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.loss</u>	<u>Moist</u>	
Athens	3,410,306	52.20	.102	7.40	.350	2.50	.460	.760	.010	1.47	13.00

Ore in Stock: Average Dried Analysis:

	<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	42,103	52.16	.103	6.54	.365	2.30	.57	.61	.087	1.35	-
Mitchell	14,545	51.78	.103	7.04	.365	2.30	.57	.61	.087	1.35	-

5. LABOR AND WAGES:

a. Comments:

The average number of employees on the pay roll during 1943 was 402 as compared with 419 in the previous year, a decrease of 17 men. During the year 69 men were hired to replace men that left the mine. Of the men that left the mine, 37 enlisted and were drafted into the armed forces, 22 men were transferred to other mines, 25 men quit to seek employment elsewhere, one man was laid off, one died, and one was retired on account of poor health.

The Marquette county draft board cooperated during the year by deferring men in all classifications of labor on surface and underground. The order by the Director of Selective Service to induct all young men between the ages of 18 and 21 inclusive will prove serious as 33 men of this age are working in the mine. They comprise motormen, brakemen, chutemen, and timber hoisters, which jobs require young active men. As a matter of fact there are no men available to replace them except old men and cripples. It is hoped a modification of this order can be

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YEAR 1943

5. LABOR AND WAGES: (CONT.)

a. Comments: (Cont.)

obtained prior to the induction of these young men, otherwise men will have to be obtained from other mines or a reduction made in the working schedule from the three to a two shift operation.

Early in the year the employees by vote selected the United Steel Workers or C.I.O. union as their sole bargaining agent. The percentage of employees joining the union was less than 65% and has remained at approximately this figure since the agreement was signed. No grievances have been presented to the supervisory force as had been expected which is fortunate as some of the other mines of the Company have had a number. There is a good feeling prevailing between the men and the supervisory force, also the grievance committee seems disinclined to pay attention to petty grievances. It is hoped that this fortunate situation will continue.

The average monthly wages of employees in 1943 was \$177.62 as compared with \$175.30 in 1942. Wages were increased 5½ cents per hour in 1943, this however, did not effect much of an increase in monthly earnings due to less overtime on account of discontinuing the Saturday afternoon shift starting in February.

b. Comparative Statement of Wages and Product:

	<u>1943</u>	<u>1942</u>	<u>Increase</u>	<u>Decrease</u>
PRODUCT	517,814	681,748		163,934
No. Shifts and Hours	1-8 48	1-8 3	45	
	2-8 3	2-8 50		47
	3-8 249	3-8 248	1	
<u>Average No. Men Working:</u>				
Surface	75	72	3	
Underground	327	347		20
Total	402	419		17
<u>Average Wages Per Day:</u>				
Surface	7.13	6.72	.41	
Underground	8.16	7.71	.45	
Total	7.95	7.53	.42	
<u>Average Wages Per Month: (Based on Mine Payroll including Captain & Clerks)</u>				
Surface	168.20	160.14	8.06	
Underground	179.78	178.65	1.13	
Total	177.62	175.47	2.15	
<u>Product Per Man Per Day:</u>				
Surface	24.40	33.12		8.72
Underground	5.99	7.06		1.07
Total	4.81	5.82		1.01
<u>Labor Cost Per Ton:</u>				
Surface	.292	.203	.089	
Underground	1.363	1.091	.272	
Total	1.655	1.294	.361	

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5. LABOR AND WAGES: (CONT.)

b. Comparative Statement of Wages and Product: (Cont.)

	<u>1943</u>	<u>1942</u>	<u>Increase</u>	<u>Decrease</u>
<u>Average Product Mining:</u>				
Stopping	21.81	21.87		.06
Development in Ore	13.85	10.39	3.46	
Total	21.40	21.53		.13
 <u>Average Wages for Labor:</u>	 7.95	 7.53	 .42	
 <u>Total Number of Days:</u>				
Surface	21,218	20,582	636	
Underground	86,502	96,537		10,035
Total	107,720	117,119		9,399
 <u>Amount for Labor:</u>				
Surface	151,384.52	138,362.70	13,021.82	
Underground	705,460.17	743,879.90		38,419.73
Total	856,844.69	882,242.60		25,397.91
 <u>Average Wages Per Month as Per Labor Statement - Less Captain & Clerks:</u>				
Surface	168.11	159.75	8.36	
Underground	179.29	178.35	.94	
Total	177.32	175.30	2.02	

Proportion of Surface to Underground Men:

1943 - 1 to 4.36

5 3-8 hr. shifts and one 2-8 hr shift January 1st to February 1st.
5 3-8 hr. shifts and one 1- 1-8 hr. shift Feb. 1st to Dec. 31, 1943.

1942 - 1 to 4.819

5 3-8 hr. shifts and one 2-8 hr. shift January 1st to Dec. 31, 1942.

c. Operating Schedules - 1943:

<u>Month</u>	<u>Days Mine</u> <u>Worked per Week</u>	<u>Days Per</u> <u>Month</u>	<u>Days Men</u> <u>Worked</u> <u>Per Week</u>	<u>Avg. Shifts Worked</u> <u>Per Month</u> <u>By Each Man</u>
January	6	17	5 & 6	15
February	6	24	5 & 6	21
March	6	27	5 & 6	24
April	6	26	5 & 6	23
May	6	26	5 & 6	23
June	6	26	5 & 6	23
July	6	26	5 & 6	23
August	6	26	5 & 6	23
September	6	25	5 & 6	22
October	6	26	5 & 6	23
November	6	25	5 & 6	22
December	6	26	5 & 6	23
Total		300		265
Average for year mine operated		25.0		
Average for year worked by eachman				22.08

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6. SURFACE:

a-1. Buildings:

A portion of the sheet iron covering of the timber tunnel enclosure rusted out after 25 years exposure and had to be replaced. A number of the sills at the base of the sheet iron covered frame side walls that rest on three foot concrete walls rotted and were replaced with new sills. The West 200 feet of the tunnel has settled slightly due to the settlement of the ground adjacent to the cave to surface resulting in a break in the tunnel roof and side walls. The break was temporarily repaired as it is impossible to make permanent repairs as settlement will continue. The side doors that are opened when loading the timber trucks were repaired and several rotted and broken ones replaced with new doors.

A storm shed was built in the mine carpenter shop and installed at the mine office Northwest entrance door. It had previously been difficult to heat the office when temperatures were below zero and high winds blowing from the Northwest.

In October, the windows in the engine house, office and dry house were inspected and necessary repairs made. New heavy window frames and sash were made and installed in the top tram controller house to replace the light frames and sashes which were in bad condition due to vibration of the shafthouse when the skips are dumped. Wooden strips instead of putty was used to hold the glass in the frames. In a heavy wind storm in September, some of the ferro board covering on the shaft house was torn off. It was replaced immediately after the storm. In early November the entire shaft house covering was inspected and necessary repairs made. In the summer all doors on the top tram landing were overhauled and repaired.

The loading platform at the rear of the warehouse rotted after many years service. It was torn out and a new platform built.

a-2. Docks, Trestles and Pockets:

The five wood bents leading from the Southeast Steel trestle to the rock stocking grounds had rotted after 28 years service and were no longer safe to use. They were torn down in May and replaced by new bents and stringers.

Worn plates in the railroad loading pockets in the shaft house were replaced by new plates before shipping from the pockets was started in the spring. New ties were installed on the Northeast steel stocking trestle replacing ties that had rotted. Also rotted decking was replaced on the permanent steel trestle. The guard rails on the permanent steel stocking trestles were also overhauled and repaired.

b. Stockpiles:

(1) Ore:

Shipping from the pockets and stockpiles was late in starting to Eastern lake ports due to ice conditions in Lake Superior. Shipments to Escanaba docks on Lake Michigan started from pockets March 29th and from stockpile April 3rd. Shipments to Marquette docks was started

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6. SURFACE: (CONT.)

b. Stockpiles: (Cont.)

late in April. Considerable frozen ore was encountered in the stockpile and it was necessary to drill and blast. All the ore in stock was loaded in August. The caterpillar tractor equipped with trail builder was used to clean up the scattered ore on the stockpile grounds. For the balance of the shipping season only wet ore was stocked, this amounted to only about 6,000 tons on November 1st and was not loaded and shipped.

(2) Rock:

The only expense for stocking rock in 1943, other than replacement of five bents near the permanent steel trestle, was incurred for pushing rock away from the trestle with the tractor trail builder. Without this equipment there would have been considerable expense for additional rock trestle, splicing in haulage rope, track extension, etc.

c. Cave to Surface:

The cave to surface extended Eastward in 1943 and also in one area a short distance to the South. The entire area involved in the cave sunk several feet and many new cracks appeared on the East side some of which extended across the property to the North line of the cave. The South extension involved four privately owned lots, on which there were houses that were occupied, also one lot owned by the Company. Two of the privately owned lots were purchased and an effort made to purchase the other two but a satisfactory price has not yet been reached. Three houses have been vacated and the house on one of the lots that was purchased has been dismantled and removed. The Company owned house was sold to the tenant and moved to another part of the town. The removal of ore under the caved area will result in further settlement but there is no danger to the tenant remaining in the house as his house is fortunately located South of the cracks caused by the movement of the surface ground adjacent to the cave. Only the rear two-thirds of his lot is involved in the cave area.

d. Deep Wells:

No. 1 Deep Well went into operation in December 1942 and operated steadily throughout 1943. The amount of water pumped varied from 45 gallons per minute in the winter of 1942-1943 to 75 gallons per minute after the spring breakup and during the early summer months when there was heavy rainfall. It decreased to 40 gallons per minute in the dry weather of late summer and continued at approximately this rate for the balance of the year.

No. 2 Deep Well - The pump and other equipment for this well was delivered in the spring of 1943. A 25 foot tripod was made at the mine and set up over the well. An experienced man was obtained from the Layne Northwest Company to install the pump. The pump for this well was designed to pump intermittently. The well had been chambered

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6. SURFACE: (CONT.)

d. Deep Wells: (Cont.)

by blasting to gain more capacity for storage and also in the hopes that more water courses would be intercepted in the broken ledge. On June 3rd the pump was lowered into the well and put in operation. The amount of water at this well proved disappointing as it amounted to only about 15 gallons per minute. The pump operates for 20 minutes about every four hours. In the idle interval the well fills with water to a predetermined point where the pump starts operating again. A house to enclose the well and electrical equipment was built at the mine shop and moved by truck to the well.

Breitung Shaft

The agreement made with the Interstate Iron Company for use of this shaft for pumping states that the Athens Iron Mining Company must keep the shaft in good repair. The cover over the shaft was entirely renewed in the summer as the three inch plank covering had rotted and was no longer safe.

e. Water Purchased for Heating, Cooling, etc.:

The cost of water purchased from the City of Negaunee the last three years is as follows:

	<u>1943</u>		<u>1942</u>		<u>1941</u>	
	<u>Gallons</u>	<u>Amount</u>	<u>Gallons</u>	<u>Amount</u>	<u>Gallons</u>	<u>Amount</u>
1st Quarter	2,818,000	207.94	3,118,000	207.94	2,364,000	179.44
2nd Quarter	3,195,000	233.92	3,195,000	233.92	2,450,000	182.23
3rd Quarter	3,111,000	229.07	3,111,000	229.07	2,477,000	184.50
4th Quarter	<u>3,492,000</u>	<u>247.44</u>	<u>3,083,000</u>	<u>226.40</u>	<u>2,621,000</u>	<u>197.78</u>
Total	12,616,000	918.37	12,507,000	897.33	9,912,000	743.95
Product-Tons	517,814		681,748		648,750	
Cost per ton	.001774		.001316		.001147	

More city water was used in 1943, than in 1942 or 1941 when more ore was mined. The increase in 1943 was due to installation of a new meter by the city at the mine to replace the old meter which was often out of order and consumption had to be estimated. More development in rock increased the water used in the mine for spraying to lay the dust, warmer weather in the summer increased the amount used at the cooling tank near the engine house for cooling the water that had been circulated through the compressors.

f. Grounds and Fences:

The grounds at the mine were kept in good condition during the year. The shrubbery was pruned quite severely as it had grown to heights that shut off light in the buildings.

Fences around the caving area were inspected regularly and necessary repairs made. The extension of the cave made it necessary to move sections of the fences to new locations, and in some cases to build new fences.

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7. UNDERGROUND:

a. Shaft Sinking:

There was no shaft sinking in 1943.

b. Development, General Remarks:

As a result of the fire in the mine in January 1943, it was necessary to abandon a mining area in which seven contracts worked. To replace this area it became necessary to start developing other areas. Block one was mined out, mining was underway in Block 2, 3, and the West half of Block 4, also the entire area above the 4th Level in Blocks 5 and 6, East to the Corbit Lease was being developed at the close of 1942. The only undeveloped large area was located between the 6th and 4th Levels in the East half of Block 4 and Block 5. Mining was underway above the 4th Level in part of these blocks but there was still a large undeveloped area available for mining. Plans were made for the development of the 5th Level in this area. It was impossible to connect this new level with the shaft for the duration of the war as no shaft station had been cut at the 5th Level elevation when the shaft was sunk. To cut a shaft station would require the mine to be shut down for several weeks and this was out of the question. It was therefore decided to open the 5th Level half way between the 4th and 6th Levels at elevation of 500 feet, in the ore body and transfer the ore to the 6th Level. It is impractical to mine a block 230 feet in height as the raises wear out and cause serious delays, they also tend to block if the ore is damp, also there is an excessive amount of raising in rock. By opening a transfer level these handicaps would be avoided and later on a connection can be made to the shaft. In addition to driving drifts on the 5th Level and putting up raises to the top of the ore body, it was necessary to drift on the 6th Level and put up a number of raises to the 5th Level elevation. The location of the 6th Level raises was based on a maximum scraping distance of 125 feet on the transfer or new 5th Level. In addition it was necessary to plan for two ventilation raises from the 4th to 6th Level as the present airway raises are in ore and within the new mining area. This heavy development program got underway late in the summer and was continued for the balance of the year. It will continue throughout 1944.

In addition to this new development, a limited amount of drifting and raising was necessary during 1943 on nearly all of the levels.

b-1. Development in Ore:

4th Level

A considerable amount of development and exploratory work was carried on along the North footwall adjacent to the Corbit Lease where small known ore areas had been developed years ago in the Corbit Lease. A transfer drift Northwest of No. 417 Raise on the -230' Sub-level was completed to the slate footwall in February. At the North end of the transfer drift No. 415B Raise was extended to the -170' Sub-level. At this elevation only small ore stringers were found along the North slate footwall and lean ore and jasper to the South. Similar development was likewise carried on East of No. 415 Raise on the Corbit Lease where only

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7. UNDERGROUND: (CONT.)

b-1. Development in Ore: (Cont.)

a narrow stringer of ore was located along the South side of an East-West dike. Mining in this area was continued during the balance of the year on several sub-levels. The ore body gained in width on each succeeding lower sub-level.

In July, a mining limit was established on the 3300 coordinate and West from the Lucky Star boundary to Lot 10 to prevent undermining the Southeast Steel stocking trestle and stockpile grounds. Further exploratory work was then temporarily abandoned on the Corbit Lease. The ore development for the balance of the year was confined entirely to raising. No. 407 Raise was extended to an inclined height of 178 feet of which all but the first 15 feet were in ore. This raise encountered small seams of dike and also a considerable flow of water which hampered the exploratory work throughout the year.

No. 413 Raise was extended to the -275' Sub-level or an inclined height of 132 feet above the 4th Level. The raise was in ore the entire distance, it is located within the stocking trestle mining limit and can only be used in future mining.

5th Level

In July, 6th Level raise No. 608 was extended to the -500' Sub-level and drifting operations were started in August preparatory to opening the 5th Level. In November approximately 230 feet of ore drifting was completed to the Northeast. Operations were then temporarily stopped to await completion of a raise from the 6th Level after which drifting will be resumed.

6th Level

There was no ore development on this level during 1943.

7th Level

On the 7th Level and one sub-level above there was a total of 130 feet of drifting in ore. Ninety feet of drift in ore was driven in March on an incline upward from No. 730 Cross-cut to prove if the fire was extinguished. On the 625' Sub-level, a drift was driven 40 feet in ore along the North footwall dike to cut off the water which interfered with mining in this area.

8th Level

The ore development work was confined to extending two raises for mining above No. 860 Cross-cut. No. 864 Raise was put up to the 7th Level elevation a distance of 107 feet in ore and later was extended to the -660' Sub-level where mining operations were started.

No. 862 Raise which is located just 50 feet North of No. 864 Raise was extended to the -660' Sub-level where mining was also immediately started.

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7. UNDERGROUND: (CONT.)

b-1. Development in Ore: (Cont.)

8th Level: (Cont.)

In April after the completion of the two above mentioned raises, a cutout was made on the -720' Sub-level where a ventilation and traveling ore drift was driven to the Southwest to No. 814 Raise and later to the Northeast to No. 864A Raise.

The following is a summary of the development footage in ore in 1943.

<u>Location</u>	<u>Drifting</u>	<u>Raising</u>	<u>Total</u>
-170' Sub		65	65
-230' Sub		27	27
-290' Sub		20	20
-300' Sub	111		111
-330' Sub	26		26
-365' Sub		10	10
4th Level	30	343	373
-500' Sub (5th Level)	249	64	313
-625' Sub	40		40
7th Level	90		90
-720' Sub	221	45	266
8th Level	<u>103</u>	<u>448</u>	<u>551</u>
Total 1943	<u>870'</u>	<u>1022'</u>	<u>1892'</u>
Total 1942	<u>65'</u>	<u>1690'</u>	<u>1755'</u>
Increase	<u>805'</u>		<u>137'</u>
Decrease		668'	

b-2. Development in Rock:

4th Level

The North footwall drift to the East was extended from No. 410 Cross-cut early in 1943. This work was continued through May with a total advance of 140 feet in the slate footwall. In December, drifting was resumed by a one shift contract until such a time as the 5th Level development is further advanced. It might be added that the development of the Corbit Lease has been temporarily postponed.

6th Level:

In September, drifting operations for the development of the 6th and 5th Level in Blocks 4 and 5 was started by driving a footwall drift to the Southeast of the main level drift. After an advance of 120 feet, the footwall drift was turned due East and was extended an additional 95 feet. In December, work was underway in starting rock raising for the further development of the 5th Level. No. 610 Cross-cut to the South was also turned off and will be extended as described under the general heading. The total advance amounted to approximately 225 feet in footwall slate which required timbering due to the slabby nature of the ground after exposure to air.

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7. UNDERGROUND: (CONT.)

b-2. Development in Rock: (Cont.)

7th Level:

A new 7th Level by-pass drift was started in March from the North end of No. 710 Cross-cut. This drift was driven in slate and diorite and required timbering. A connection to the 7th Level main drift was completed in August after a total advance of approximately 310 feet. As previously mentioned, this drift in addition to improving ventilation will later be used for tramming when the main drift in the vicinity of No. 702 and 701 Raises caves as a result of mining.

8th Level:

No. 860 Cross-cut was started in January. This drift is located East of No. 810 Cross-cut and has opened the East portion of the ore body above the 7th Level to mining. A cross-cut was advanced a total distance of 200 feet of which 55 feet was in diorite, 103 feet in ore, and the remaining 42 feet in rock. It was stopped in the main fault dike. The drift was completed late in February and work was immediately started on raises No. 862 and 864.

There was no rock development work done on the 8th, 9th, and 10th Levels in 1943.

The following is a summary of the development in rock in 1943.

<u>Location</u>	<u>Drifting</u>	<u>Raising</u>	<u>Total</u>
-170' Sub	125		125
-230' Sub	15	20	35
-245' Sub	82		82
-260' Sub	58		58
-340' Sub	12		12
-365' Sub	20	10	30
4th Level	202	15	217
6th Level	418		418
7th Level	378	165	538
-720' Sub	80		80
8th Level	95	95	190
10th Level	15		15
Total 1943	<u>1500'</u>	<u>305'</u>	<u>1800'</u>
Total 1942	<u>1178'</u>	<u>543'</u>	<u>1721'</u>
Increase	322'		79'
Decrease		238'	

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7. UNDERGROUND: (CONT.)

c. Stoping:

(1) General:

The product in 1943 was obtained from approximately the same areas and mining blocks as in the previous year, viz.: Blocks 2, 3, 4, 5, and 6. The latter block was opened early in the year above the 4th Level but only a small portion of the product was mined here. This was due to the necessity of establishing a mining limit in about the center of Block 6, extending West to center of Block 5 to act as a protection against the possibility of caving the Southeast steel stocking trestle and stockpile grounds on surface. For this reason, only the South portion of Block 6 is considered available for mining. Athens Lot 12 and the Corbit Lease, Lot 13, are in the Block 6 area.

The locations of the mining contracts at the end of the year 1943 and 1942 are given below.

	<u>1943</u>		<u>1942</u>
10 above 4th Level		9 above 4th Level	
3 above 6th Level		5 above 6th Level	
8 above 7th Level		9 above 7th Level	
1 above 8th Level		1 above 8th Level	
4 above 9th Level		5 above 9th Level	
1 on 10th Level		0 on 10th Level	
Total	<u>27</u>	Total	<u>29</u>

There were 27 contracts working in December 1943 as compared with 29 a year ago. They were divided as follows:

<u>1943</u>	<u>1942</u>
Mining - 22 Contracts	Mining - 27 Contracts
Developing - 2 Raising	Developing - 1 Raising
- 3 Drifting	- 1 Drifting
Total - 27 Contracts	Total - 29 Contracts

The above table shows total loss of two contracts, but five less mining and three more on development work.

The following table gives number of miners, working schedule:

	<u>1943</u>	<u>No. Miners</u>	<u>1942</u>	<u>No. Miners</u>
Three shift contracts	18	108	27	162
Two shift contracts	6	24	1	4
One shift contracts	<u>3</u>	<u>6</u>	<u>1</u>	<u>2</u>
Total	<u>27</u>	<u>138</u>	<u>29</u>	<u>168</u>

In December 1943, there were 47 company account miners and timbermen as compared with 62 a year ago. The loss for the year was 30 contract miners and 15 timbermen and company account miners.

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7. UNDERGROUND: (CONT.)

c. Stoping: (Cont.)

Above the 4th Level ore was mined in 1943 on the -185', -200', -230', -245', -260', -275', -290', -300', -315', -330', -340' and -365' Sub-levels.

In the area between the 6th and 4th Levels, ore was mined on the -540', -550', and -565' Sub-levels and on the 6th Level elevation. In addition some ore was obtained from the development work on the -500' Sub-level or proposed new 5th Level.

Between the 7th and 6th Levels, ore was mined on the -600', -615', -625', -635', -660', 675' Sub-levels and 7th Level elevation.

In the area between the 8th and 7th Levels, there were no mining operations carried on, although a number of 8th Level raises are being used in mining above the 7th Level.

Between the 9th and 8th Levels, ore was mined on the -830', -840', -855', and -865' Sub-levels.

During the year 1943, ore was mined on 27 different sub-levels as compared with 28 in 1942.

The mining areas below the 4th Level elevation decreased in size on practically each succeeding lower sub-level due to advance of the footwall. Above the 4th Level where mining starts under the hanging, the sub-levels increase in size due to extension under the jasper hanging wall.

(2) Detail of Stoping:

The following is a detailed description of mining on the various blocks beginning with the highest areas in Blocks 5 and 6 above the 4th Level.

Blocks 5 and 6 Above the 4th Level:

The development of this new mining area was continued early in 1943 in the North and East portion of Athens Lot 12 and the East 50 feet of Mitchell Lease Lot 11. This area was originally explored by several drifts and raises on the -170' Sub-level which showed varying widths of ore interspersed with jasper masses and divided by dikes. This exploratory work was carried on through transfer raises extended above No. 417 transfer on the -230' Sub-level. The transfer was driven Northwest of No. 417 Raise and past No. 415 Raise on the West or the hanging side where it was continued approximately 75 feet to the slate footwall. Transfer raise No. 415B was extended from a point near the North footwall to the -170' Sub-level. Several drifts and slices were driven to the East and West of the raise which proved that there was only a small ore riser in this locality on the footwall, bounded by dike and lean ore. Early in the year some exploratory work was also carried on East of No. 415 Raise which in the meantime had also been extended to the -170' Sub-level. A drift was extended to the East to the original exploratory drift driven many years ago on the Corbit Lease. A second transfer raise

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7. UNDERGROUND: (CONT.)

c. Stoping: (Cont.)

No. 415A was extended to the -135' Sub-level and after some exploratory work at this elevation where little or no ore was found, operations were continued on the -170' Sub-level. For the most part the ore lay along the South side of small dikes and had an average width of approximately 25 feet. It might be added that the ore was extremely irregular not only laterally, but vertically as well, indicated by the various raises which have been extended into this area. In May, Raises 415B and 415 were opened on the -185' Sub-level and mining showed that both raises had been extended upward in small risers of ore bounded by dike and lean ore. Later in the year the -200' Sub-level was opened from No. 415 Raise where operations were underway for the balance of the year. The ore at this elevation lay South of the dike and averaged approximately 40 feet in width with an East-West length of approximately 180 feet. At the present time indications are that the ore area will increase in size as mining is temporarily continued on the lower sub-levels. It is unfortunate that mining in this area must soon be abandoned in order to protect the Southeast steel trestle and stockpile grounds.

A short distance to the Southwest a relatively large ore area was mined in lots 10 and 11 on the -230' and -245' Sub-levels. This area is adjacent to the North footwall and under the jasper hanging wall which is receding to the West. On the -245' Sub-level the approximate size of this area is 260 feet by 140 feet. In December, mining operations were completed at this elevation and the three contracts working here are now mining on the -260' Sub-level. Near the end of the year, it was found that the jasper hanging to the Southwest made a decided roll reducing the size of the area by approximately 25%.

The development to the West in Lot 9 was started near the middle of the year from No. 407 Raise on the -260' and -275' Sub-levels. Exploratory work here once more showed that the raise had been located in a small ore chimney bounded by dike on the North and West and lean ore and jasper on the South and East. Operations were temporarily stopped here late in the year due to a heavy flow of water which had developed along the dike.

Mining was continued during the year on the South side of the 4th Level ore body near the South footwall in Lot 12. The -275' Sub-level and the -290' Sub-level were mined during the year and in December two of the three raises were being opened on the -300' Sub-level. This ore body has extended to the South approximately 60 feet under the jasper hanging to the slate footwall. The enlarged area lies South and West of No. 423 Raise and adjacent to the old workings in Mitchell Lease Lot 11.

Mining operations were continued in the small area located in Athens Lot 10 and the Mitchell Lease Lot 11. This mining area lies along the North end of the 4th Level ore body and near the jasper mass which is so irregular in its general outline. During the year, the -330' Sub-level and the -340' Sub-level were completed and late in December mining was started on the -355' Sub-level. This ore body is enlarging to the West and now includes an area 60 feet by 190 feet.

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7. UNDERGROUND: (CONT.)

c. Stoping: (Cont.)

In the mining area South of No. 406 Raise on the -365' Sub-level which lies on the South end of the ore body near the central core, operations were continued throughout the year. The approximate size of this area is 130 feet by 140 feet. A considerable portion of the mining here during the past year was under jasper hanging wall material with the ore widening to the South and West. It might be added that this sub-level is approximately 28 feet above the 4th Level and it is this area as well as the ore body to the South and West which will soon be developed from the new 5th Level.

4th Level:

Other than the development by drifts and raises on this level which has already been discussed, repair and maintenance work was carried on throughout 1943. A considerable amount of repair work has been necessary due to the timber rotting and crushing both in the No. 400 and 410 Cross-cuts which extend across the ore body.

South Side of Fault Dike, Block 4 Above 6th Level
Ore Area Adjacent to South Footwall

There was very little activity between the 4th and 6th Levels during the year as indicated by the product which amounted to only 4% of the total. The development of the 5th Level was started in August on the -500' Sub-level. This work is described under the development heading. Two contracts continued mining at the South end of the West half of Block 4 along the South slate footwall. Later in the year when a 7th Level raise had been completed to this area and with the reduction in size of the ore body on the -550' Sub-level, one contract was moved to another territory. In November, operations were continuing on the -565' Sub-level near the South footwall adjacent to the old mining area to the North and West. It is evident that only one more sub-level, the -580' Sub-level can be opened due to the rapid flattening of the slate footwall which will cut off the ore.

South Side of Fault Dike, Lot 4 Above the 6th Level
Ore Area directly South of Fault Dike

Early in the year mining was underway on the 6th Level elevation in the West half of Block 4. Mining was carried on from two 7th Level raises in this area which is bounded by the main fault dike on the North and lean ore and footwall material to the South. It might be added that a 30 foot pillar has been established between this area and Block 3 in which the mine fire originally occurred and later started again in January of this year.

6th Level

There was only a small amount of product mined above the 6th Level as indicated under the production heading which shows that 4% of the total product came from this level. Production can only be increased by development of the East half of Block 4 and areas further to the East between the 5th and 4th Levels. It was necessary to carry on the usual amount of maintenance work on the main level in order to keep the ventilation and traveling roads open.

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7. UNDERGROUND: (CONT.)

c. Stoping: (Cont.)

South Side of Fault Dike, West Half of Block 4 Above the 7th Level

Mining was started in this area after mining was completed above the 6th Level early in the year. Two contracts continued working here and during 1943 completed mining on the -600', -615', and -625' Sub-levels, and at the end of the year on the -635' Sub-level. The mining area is 140 feet in length and 90 feet in width bounded on the North by the fault dike and on the South by the slate footwall which reduces the area by about ten feet per sub-level. The protecting pillar on the West side has been maintained at a width of 30 feet which cuts off all contact with the fire area on the -635' Sub-level and above.

North Side of Fault Dike, Block 4 Above 7th Level

Ore was mined in this small area during 1943. It is reached by Raises No. 713 and 714 from the 7th Level. The ore was mined early in the year by two contracts at the 6th Level elevation. After opening the -600' Sub-level one contract moved down to the -625' Sub-level and drove a drift along the dike, which bounds the ore body on the North side, in order to catch the heavy flow of water, after which it moved to a new location. Mining has since been continued by one contract under more favorable conditions since the water that comes in along the North dike has been under control. During the year, mining was completed on the -600' Sub-level and on the -615' Sub-level. At the end of the year, the ore area here was 60 feet wide by 140 feet in length. It gradually grows smaller with depth and is cut out at approximately the 7th Level elevation by the footwall and the mined area to the West.

The ore body North of the fault dike starts a short distance above the 4th Level where it was mined out several years ago from 6th Level raises. Mining of the small area remaining above the 7th Level in the West half of Block 4 will complete mining of this ore body North of the fault dike down to the area now being mined to the West in Block 3 at the elevation of the 7th Level.

North of Fault Dike, Block 3 Above the 7th Level

The area North of the dike has been mined in two separate units in the past and this practice was continued in 1943. Two contracts continued mining from 8th Level Raises No. 862 and 864 in the East end of the block while three contracts using Raises No. 816, 815, and 812 carried on mining on the West part of the block and adjacent to the old workings in Block 2. These five contracts are mining in an area approximately 300 feet in length with an average width between the fault dike and the North footwall of 140 feet. During the year, mining on the -660' Sub-level and the -675' Sub-level were completed. Late in the year, mining operations by the five contracts were begun on the 7th Level elevation. Near the middle of the year the mining limit between the East and West areas was moved to the center of the block so as to more evenly divide the ore between the various contracts. Mining conditions in this area are very favorable as the ore is soft and free from water.

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7. UNDERGROUND: (CONT.)

c. Stoping: (Cont.)

Ore Area South of Fault Dike, Block 2 Above the 9th Level

Four contracts were engaged in mining in Block 2 and in February 1943 mining on the -830' Sub-level was completed and later on the -840' Sub-level. By the end of the year mining was nearly completed on the -855' Sub-level and development of the -865' Sub-level was underway. A considerable amount of water continued to handicap mining operations particularly along the fault dike which stands approximately vertical. On the South side of the area, conditions are somewhat better due to the flat South footwall where the water is virtually under control by drainage from the area mined on the upper sub-levels. Production from this area has been slowed up not only due to the water but also to the heavy pressure on the sub-level and on the 9th Level drift below from which the raises were extended. The -865' Sub-level which is now being developed by drifting to connect the raises is only 28 feet above the 9th Level floor. These wet conditions have also affected the hoisting of this ore which is mixed with drier ore from other contracts for ease in handling. When an excessive amount of wet ore has to be loaded from raises, trammed and hoisted, a delay in handling cannot be avoided.

9th Level

The product mined above this level amounted to 15% of the total product for the year. This tonnage came entirely from Block 2 in the wet area described above. There was a large amount of re-timbering necessary in the vicinity of the raises in the 9th Level drifts. During the year this drift was completely retimbered and the track lowered.

10th Level

There was relatively little activity on this level during 1943. A considerable amount of clean up work was done near the middle of the year which resulted from an accumulation of mud during the period several years ago when the main haulage drift was used as a sump. In December, a new cross-cut was started to open the 9th Level Block 2 area to mining.

d. Timbering:

The total cost of timbering listed under account number 6 on the Cost Sheet increased \$13,377.49 in 1943. This increase was less than in 1942 or 1941 but due to the large decrease in product resulted in a considerably higher cost per ton of ore. The increase in cost for stulls, lagging and poles was .038 per ton of ore due to higher prices paid for these supplies. The shortage of men available for work in the woods and the higher wages paid to procure new recruits account for the higher price of all wood products. The raise in wages of 5½ cents per hour increased the labor cost. The shortage of company account miners and timbermen which grew steadily worse as the year progressed made it necessary to work more shifts on repair of main level drifts, raises, and ventilation airways on Saturday at time and one-half. The total cost per ton "Timbering" was \$.713 in 1943 as compared with \$.525 in 1942, an increase of \$.188 or approximately 36%. This was the highest

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7. UNDERGROUND: (CONT.)

d. Timbering: (Cont.)

cost per ton in the history of the mine. It exceeded the cost for "Stoping" by .198 per ton which gives a clear picture of the conditions existing in 1943. The fire in the mine is responsible for a portion of this increase, as it made it necessary to develop new territories to take the place of productive areas that had to be abandoned, it was also mainly responsible for the decrease in production.

The picture is perhaps made more clear by comparing the total cost of timber, lagging, poles, etc., for the years 1942 and 1943 which was \$82,305.17 as compared with \$82,410.65. The feet of stulls and cribbing timber used in 1943 was 23% less than in 1942, 9½ foot poles 13% less, and 7 foot lagging 16% less, yet the cost of these supplies was practically equal to the cost of the larger quantity used in 1942.

One other factor affecting timbering cost in 1943 is worthy of comment, namely, lack of treated timber available in the latter part of 1941, 1942, and 1943, which made it necessary to use untreated timber in drifts where there was no heavy pressure. Rotting of timber in this mine is rapid due to the high humidity and warm air which reduces the life of untreated timber as much as 400% in some areas or from eight years with treated timber to two years with untreated timber. The lack of treated timber is due entirely to the labor shortage caused by the war which cut down the available supply of stull timber in 1942 and 1943, and also made it impossible to divert labor for peeling logs prior to treatment.

Brief comment is made herewith regarding the repair work in 1943.

The two cross-cuts on the 4th Level had to be retimbered in 1943 due mainly to rotting of the untreated timber installed here in 1941. The old West footwall drift on this level was also retimbered for several hundred feet. This is the main exhaust airway for the warm moist air coming from the lower levels. Most of the old timber here had been treated and in service for six to ten years, unfortunately it had to be replaced with untreated timber that will rot in two years or less.

The haulage drift on the 6th Level had to be retimbered at various points due to crushing and rotting of timber.

On the 7th Level it was necessary to do considerable repair work to keep the level open and maintain the seals put in to close off the air from the fire area.

The 8th Level drifts and crosscuts required more than the normal amount of repair work due to use of this level for tramming ore from mining operations just above the 7th Level.

The 9th Level drift under the area being mined between the 9th and 8th Levels required constant repairs during the year due to the heavy pressure which is increasing as mining approaches the 9th Level elevation.

Repairs on the 10th Level were confined to a section of the haulage drift where the timber had rotted beyond which the new cross-cut was to be located. The new cross-cut will be required for mining the ore in Block 2 now being mined 28 feet above the 9th Level.

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7. UNDERGROUND: (CONT.)

d. Timbering: (Cont.)

Statement of Timber Used:

	<u>Lineal</u> <u>Feet</u>	<u>Avg. Price</u> <u>Per Foot</u>	<u>Amount</u> <u>1943</u>	<u>Amount</u> <u>1942</u>
6" to 8" Cribbing	125,520	.0531	6,667.92	7,008.59
8" to 10" Stulls	6,043	.0807	487.42	213.67
10" to 12" "	146,892	.1318	19,366.29	19,478.88
12" to 14" "	59,546	.1697	10,107.74	8,932.22
14" to 16" "	24,478	.2038	4,989.04	2,183.57
Treated Timber	-----	-----	-----	1,363.46
 Total 1943	 362,479	 .1148	 41,618.41	
 Total 1942	 445,702	 .0879		 39,180.39
 7' Lagging	 1,574,069	 1.0509	 16,541.86	 16,554.62
9½' Poles	1,291,821	1.8529	23,936.46	26,381.30
Total 1943	2,865,890	1.4124	40,478.32	
Total 1942	3,383,050	1.2691		42,935.92
 Wire Netting	 3,465		 208.44	 294.34

	<u>1943</u>	<u>1942</u>
PRODUCT FOR YEAR - TONS		
- TONS	517,814	681,748
Ft. Timber per ton of ore	.7000	.6538
Ft. Lagging per ton of ore	3.0398	2.6736
Ft. Poles per ton of ore	2.4948	2.2886
Ft. Lagging per ft. of Timber	4.3425	4.0897
Cost per ton for Timber	.0804	.0575
Cost per ton for Lagging	.0319	.0243
Cost per ton for Poles	.0462	.0387
Cost per ton for Wire Netting	.0004	.0004
Cost per ton for Timber, Lag. Poles, & Net.	.1589	.1209
Equivalent of Stull Timber to Bd. Measure	801,719	820,452
Ft. of Board Measure per ton of ore	1.5483	1.2035
Lineal ft. of Netting per ton of ore	.0067	.0068
Sq. Ft. of Netting per ton of ore	.0279	.0282

	<u>AMOUNT</u>	<u>COST PER TON</u>
Total Cost of Timber, Lagging, Poles, Etc. for Year 1943-	82,305.17	.1589
do	1942	82,410.65
do	1941	67,589.93
do	1940	59,589.66
do	1939	47,153.85
do	1938	35,920.27
do	1937	49,763.66
do	1936	35,719.77
do	1935	22,585.11
do	1934	19,546.06

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7. UNDERGROUND: (CONT.)

e. Drifting and Raising:

The following table gives a comparison of total feet of drifting and raising in ore and rock in 1943 and 1942.

<u>Year</u>	<u>Drifting</u>		<u>Raising</u>		<u>Grand Total</u>
	<u>Ore</u>	<u>Rock</u>	<u>Ore</u>	<u>Rock</u>	
1943	870'	1500'	1017'	305'	3692'
1942	269'	973'	1858'	578'	3678'
Increase	601'	527'			14'
Decrease			841'	273'	

There was a large increase in drifting due to the extensive development program that was started immediately after the fire in the mine in January 1943. The increase in drifting was virtually offset by a decrease in raising making total footage for the two years practically equal. Only a limited number of raises were necessary in 1943 as most of the 4th, 7th, 8th, and 9th Level raises were completed in 1942.

f. Explosives, Drilling and Blasting:

The cost per pound for powder was the same as in the three previous years, namely \$.115 per pound. The expenditure for powder decreased \$5,844.66 in 1943 while the product decreased 163,934 tons resulting in an increase of \$.0020 in the cost per ton for powder. The total cost for powder, fuse, and caps was .0026 higher per ton of ore in 1943. Even with this increase the total cost was only \$.0559 per ton which is the lowest cost at any of the Company mines in the Negaunee District. This is due to the ore being softer than in the other mines. The increase in explosive cost was due to harder ore encountered near the hanging wall jasper in the new areas being opened for mining above the 4th Level.

There were no changes in the method of handling explosives in 1943. The "Federal Explosives Act" with its long list of rules has been followed as far as practical. Several inspections were made during the year of the underground powder magazines by the Bureau of Mines representative. Supervision of blasting practice in each of the contracts was made by the shift bosses twice each year prior to 1943. Due to a fatal blasting accident in one of the Company mines in 1943 caused by violation of the rule covering use of fuse lighters, it was decided to have inspections made every sixty days, and a report made on the special printed form that has been in use for several years. Miners grow careless in use of explosives through constant use and occasionally will take chances. The fuse lighter burns about one minute and ten seconds and the six foot fuse approximately four minutes, giving the miner ample time to get a safe distance away from the blast. Inspections cover method of attaching cap and fuse to the dynamite, insertion of powder in drill holes, tamping, and use of fuse lighters.

The quality of auger drill steel available since the war is far below that of the steel formerly imported from Sweden. Breakage is excessive even in drilling the soft ore in the Athens mine. Investigation is under way to determine if the tempering of the steel is faulty and if this proves to be a contributing cause some relief from the excessive breakage can be expected.

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7. UNDERGROUND: (CONT.)f. Explosives, Drilling and Blasting: (Cont.)Statement of Explosives Used: (Ore Development and Stopping)

	<u>Quantity</u>	<u>Average Price</u>	<u>Amount 1943</u>	<u>Amount 1942</u>
No. 1 Gelamite Powder, lbs.	199,105	11.50	22,897.06	28,741.72
Fuse - feet	808,500	5.15	4,164.14	5,164.72
Caps	111,975	12.20	1,366.11	1,690.48
Electric Caps & Delays	1,675	11.34	189.90	373.68
Tamping Bags	61,300	2.15	131.80	117.88
Fuse Lighters	20,000	6.75	135.04	158.66
Connecting Wire - lbs.	64	.55	35.20	65.90
Shot Firing Cord- ft.	1,435	16.75	24.03	15.44
Total Fuse, Caps, Etc.,			<u>6,046.22</u>	<u>7,589.04</u>
 Total Cost All Explosives			28,943.28	36,330.76
 PRODUCT			517,814	681,748
Pounds Powder per Ton of Ore			.3845	.3666
Tons of Ore per Lb. of Powder			2.6007	2.7278
Cost per Ton for Powder			.0442	.0422
Cost per Ton for Fuse, Caps, Etc.			.0117	.0111
Cost per Ton for All Explosives			.0559	.0533
 <u>(Sinking, Rock Development, Etc.)</u>				
60% Gelatin - Lbs.	2,500	11.50	287.50	123.63
Gelamite #1 - Lbs.	13,645	11.50	1,569.19	899.53
Total Powder 1943	<u>16,145</u>	<u>11.50</u>	<u>1,856.69</u>	<u>1,023.16</u>
 Fuse - Feet	49,500	5.15	254.95	173.38
Caps - Ea.	7,025	12.20	85.69	58.69
Electric Caps & Delays	300	11.54	34.62	14.08
Tamptite Paper Shells	200	.60	1.20	
Total Fuse, Caps, Etc.			<u>376.46</u>	<u>253.87</u>
 Total All Explosives			2,233.15	1,277.03
 Total Explosives Used At Mine			31,176.43	37,607.79
 Average Price per Pound for Powder			.1150	.1150

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7. UNDERGROUND: (CONT.)

g. Mining and Loading:

The mine was idle nearly two weeks in the early part of January on account of the fire in the mine. As a result of the fire it was necessary to abandon a very productive area where seven contracts worked and to develop new areas for these contracts. Several of these contracts were transferred to the 4th Level territory where all mining was under the jasper hanging and often started in small risers that extended up into the hanging. Output was below normal here due to the many small areas and excessive poling down of the floors of the new sub-levels to make a mat as quickly as possible. Every available area in the mine was opened for mining and development work also started to open new areas. As a result it was necessary to tram on the 4th, 6th, 7th, 8th and 9th Levels which made it necessary to have more motormen, brakesmen, and chutemen. The tramping cost is high and will continue above normal until production increases and mining is confined to fewer levels.

There was no change in mining practice in 1943. In some areas an additional raise was put up to provide another working place, this reduced the area to be mined by each contract and shortened the scraper haul. The standard scraping distance is from 100 to 140 feet, but it was impossible to maintain this standard in several areas as mentioned above.

Several high speed 20 and 25 H.P. Scraper hoists were purchased in 1943 and were immediately put into service replacing old 15 H.P. slow speed hoists. These new hoists were used in transfer drifts and where the scraping distances were long.

The use of timber bulkheads to keep drifts open, especially in the latter stages of radial slicing is now considered standard practice in the soft ore mines. The bulkheads prevent sudden collapse of the sub-level and often permit removal of all the ore without retimbering over the raise.

h. Ventilation:

The new 80,000 cubic foot ventilation fan installed on the 10th Level in 1942, operated all the year. Ventilation throughout the mine has been good even above the 4th Level where air doors divert part of the upcast air to the sub-levels, some of which were nearly 200 feet above the level. Temperatures in mining areas were low enough to permit the men to work in comfort and the oxygen content was maintained near normal. Considerable expense was incurred in 1943 to provide an airway in rock from the 7th to 6th Level. This new airway made it necessary to move the inside air lock doors on the 6th and 7th Level out nearer to the shaft which also entailed some expense. New airway raises from the 6th to 4th Level must be completed in 1944 as the present airway raises will soon be included in a new mining area. Ventilation cost in 1943 was \$12,477.04 as compared with \$11,392.51 in 1942. The cost in these two years was nearly \$4,000.00 per year higher than in prior years when a fan of one-half the capacity of the new fan supplied air for the mine. The improvement in ventilation justifies the increased expense of operation.

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7. UNDERGROUND: (CONT.)

i. Pumping:

The following table gives data on pumping at the Athens and Breitung Shafts:

Period	Avg. K.W.Per Day - Athens	K.W.Per Month Breitung Pump	Avg. Gal.Per Min. - Athens	Total Cost Both Mines from Athens Cost Sheet
January	4037	2500 (Est.)	359	\$ 2559.52
February	3477	2500 "	334	2230.59
March	4183	2500 "	330	2422.49
April	4120	3280	356	2531.47
May	4700	6410	404	2923.95
June	5020	5450	411	2753.70
July	5067	6180	431	2955.14
August	3890	4500	419	2962.43
September	4597	2640	390	2712.46
October	4263	1820	364	3040.58*
November	3977	1410	337	2869.13**
December	3880	1110	328	2451.52

(*) Pumping cost in October 1943 includes \$ 451.59 for cleaning sump.

(**) Pumping cost in November 1943 includes \$347.42 for cleaning sump.

1936 Avg.	2949	3583	255	1766.08
1937 "	3003	3283	257	1749.12
1938 "	3767	3433	314	2350.42
1939 "	3991	4391	331	2291.90
1940 "	4141	858	351	2381.69*
1941 "	4008	1883	354	2351.56
1942 "	4435	2258	388	2668.91*
1943 "	4351	3358	372	2701.08**

(*) Cost increased in 1940 ^{and 1942} on account of cleaning sump.

(**) Cost increased in 1943 on account of cleaning sump and higher wages.

Average cost in 1934 prior to pumping at the Breitung 2611.79

Saving in 1935 when expense was heavy account of installing	2,600.59
Saving in 1936	10,148.52
Saving in 1937	10,352.04
Saving in 1938	3,135.96
Saving in 1939	3,838.65
Saving in 1940	2,761.20
Saving in 1941	2,922.76
Saving in 1942	685.44*
Saving in 1943	1,071.50

(*) Above the cost, prior to pumping at the Breitung.

The water pumped at the Athens Mine in 1943 averaged 372 gallons per minute as compared with 388 gallons per minute in the previous year. The decrease in 1943 amounted to 16 gallons per minute. From 1937 to 1942 inclusive there was a gradual increase in water - 257 gallons per minute pumped in 1937 to 388 gallons per minute in 1942. The gallons per minute pumped in 1942 was the highest and in 1943 the next highest

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7. UNDERGROUND: (CONT.)

i. Pumping: (Cont.)

in any year since the cave to surface in 1933. From May through August in which month there was more than normal rainfall, the water pumped per minute averaged 416 gallons as compared with 398 gallons per minute in the corresponding months of 1942. Due to the lack of rainfall in the last three months of the year the water pumped per minute decreased to 328 gallons in December as compared with 368 gallons per minute in December 1942.

The extension of the cave to surface to the East in 1943 permitted more water to enter the mine which accounts for the increase in the summer months when the rainfall was above normal. The pump at No. 1 Deep Well operated throughout the year and the pump at No. 2 Deep Well for the last eight months of the year. These two pumps undoubtedly reduced the amount of water reaching the caved area. Most of the mine water comes in on the South footwall side of the ore body. In 1943 extension of mining above the 4th Level into new territory to the East released some ground water which is draining slowly. On the North footwall side above the 4th Level considerable water was encountered in two areas which it is believed comes from old surface diamond drill holes as there is no cave to surface in this area.

Due to mining in several areas that are quite wet, the main sump on the 10th Level had to be cleaned again in 1943. It filled with ore carried in suspension in the water and settled out in the sump. The cost of cleaning the sump together with the increased cost for labor due to the $5\frac{1}{2}$ cents per hour increase in wages brought the cost of pumping for the year above the cost prior to pumping at the Breitung Shaft. The cost was also higher in 1942 when there was an expense of \$1,418.43 for cleaning sump.

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

<u>Month</u>	<u>1943</u>	<u>1942</u>	<u>1941</u>	<u>1940</u>	<u>1939</u>	<u>1938</u>	<u>1937</u>
January	359	399	330	325	297	266	244
February	334	388	327	318	282	273	239
March	330	373	324	322	297	277	237
April	356	374	334	318	293	305	242
May	404	402	334	340	338	343	266
June	411	402	367	380	357	364	269
July	431	393	386	420	382	341	271
August	419	394	363	350	375	333	271
September	390	384	363	369	360	336	263
October	364	397	360	373	348	311	262
November	337	379	365	343	334	307	260
December	328	368	397	348	329	309	263
Average	372	388	354	351	331	314	257

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7. UNDERGROUND: (CONT.)

j. Underground in General:

The operation of the mine in 1943 was radically changed from the conditions under which it was operated in 1942 in which year the largest product in the history of the mine was obtained. Everything was upset on account of the fire and as a result, production decreased and the cost of production increased considerably above the average increase at the other mines of the Company. Development that normally would have been undertaken several years in the future had to be started to provide working places for the contracts that formerly worked in the fire area.

In some mining area the number of contracts were increased resulting in more rapid mining which in turn made it necessary to speed up development on lower levels to provide for continuation of mining. The shortage of labor and hiring of men with no previous experience has delayed the progress of the development work. From the operating standpoint it was a very unsatisfactory year from nearly every angle. One cause of apprehension was however removed, namely, the danger of a wreck in the upper or circular portion of the shaft by reduction of the speed of the skip hoist from 1800 feet to 1300 feet per minute. Repairs to the steel sets were almost entirely eliminated after a few week-ends were spent in rebolting and bracing the steel sets in areas where conditions were bad. A better alinement of the sets was obtained at this time and this together with the slower hoisting speed is responsible for the elimination of repairs and removal of fears of a wreck while hoisting.

8. COST OF OPERATING:

a. Comparative Mining Costs:

	<u>1943</u>	<u>1942</u>	<u>Increase</u>	<u>Decrease</u>		
Product	517,814	681,748		163,934		
Underground Costs	1.962	1.539	.423			
Surface Costs	.202	.181	.021			
General Mine Expense	.300	.212	.088			
Cost of Production	<u>2.464</u>	<u>1.932</u>	<u>.532</u>			
Taxes	.205	.132	.073			
Total Cost	<u>2.669</u>	<u>2.064</u>	<u>.605</u>			
No. of Days Operated	300	301		1		
No. Shifts & Hours	48-1-8	3-1-8	45-1-8			
	3-2-8	50-2-8		47-2-8		
	249-3-8	248-3-8	1-3-8			
Average Daily Product	1,726	2,265		539		
<u>COST OF PRODUCTION</u>	<u>1943</u>	<u>Percent</u>	<u>1942</u>	<u>Percent</u>	<u>Inc.</u>	<u>Dec.</u>
Labor	1.725	70.0	1.308	67.7	.417	
Supplies	.739	30.0	.624	32.3	.115	
Total	<u>2.464</u>	100.0	<u>1.932</u>	100.0	<u>.532</u>	

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8. COST OF OPERATING: (CONT.)

b. Detailed Cost Comparison:

(1) Days and Shifts:

<u>Year</u>	<u>Days Mine Worked</u>	<u>Shifts & Hours</u>	<u>Men Employed</u>	<u>Total Shifts Worked</u>
1943	300	5-3-8 hr. 1-1-8 hr.	402	107,720
1942	<u>301</u>	5-3-8 hr. 1-2-8 hr.	<u>419</u>	<u>117,119</u>
Decrease	1		17	9,399

(2) Wages:

There was an increase in wages of $5\frac{1}{2}$ cents per hour effective April 1st, 1943.

(3) Comparison of Production:

Production - 1943	517,814 Tons
Production - 1942	681,748 "
Decrease	163,934 "

(4) Comparison of Number of Men and Wages:

	<u>No. Men</u>	<u>No. Days</u>	<u>Amount</u>	<u>Rate Per Day</u>
1943	402	107,720	856,844.69	7.95
1942	<u>419</u>	<u>117,119</u>	<u>882,242.60</u>	<u>7.53</u>
Increase				.42
Decrease	17	9,399	25,397.91	

(5) Tons Per Man Per Day:

	<u>1943</u>	<u>1942</u>	<u>Decrease</u>
Surface	24.40	33.12	8.72
Underground	5.99	7.06	1.07
Total	<u>4.81</u>	<u>5.82</u>	<u>1.01</u>

(6) Cost of Production:

	<u>Total</u>	<u>Cost Per Ton</u>
1943	1,275,923.76	2.464
1942	<u>1,317,083.70</u>	<u>1.932</u>
Increase		.532
Decrease	41,159.94	

	<u>Labor</u>	<u>Percent</u>	<u>Supplies</u>	<u>Percent</u>
1943	893,306.71	70.0	382,617.05	30.0
1942	<u>891,228.64</u>	<u>67.7</u>	<u>425,855.06</u>	<u>32.3</u>
Increase	2,078.07	2.3		
Decrease			43,238.01	2.3

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8. COST OF OPERATING: (CONT.)

b. Detailed Cost Comparison: (Cont.)

(7) Detail of Accounts:

	1943		1942		Inc. or Dec.	
	AMOUNT	PER TON	AMOUNT	PER TON	AMOUNT	PER TON
Days Per Week	6		6			
Shifts and Hours	1 & 2 & 3-8 hr.		2 & 3-8 hr.			
Production - Tons	517,814		681,748		163,934	
Average Daily Product - Tons	1,726		2,265		539	
Number of Days Worked	300		301		1	
<u>UNDERGROUND COSTS:</u>						
1. Exploring in Mine	583.97	.001	741.82	.001	157.85	.000
2. Skinking in Shaft						
3. Development in Rock	22188.63	.043	16320.91	.024	5867.72	.019
4. Development in Ore	15788.29	.030	13019.63	.019	2768.66	.011
5. Stopping	266710.44	.515	327917.67	.481	61207.23	.034
6. Timbering	368952.71	.713	357575.22	.525	11377.49	.188
7. Tramming	129329.44	.250	141235.85	.207	11906.41	.043
8. Ventilation	12477.04	.024	11392.51	.017	1084.53	.007
9. Pumping	32413.00	.063	34156.86	.050	1743.86	.013
10. Compressors and Air Pipes	45497.95	.088	55432.27	.081	9934.32	.007
11. Fire and Damage	12694.00	.024			12694.00	.024
12. Underground Superintendence	34114.43	.066	30128.53	.044	3985.90	.022
13. Cave-in	135.37	.000			135.37	.000
14. Maint: Compressors and Power Drills	4431.54	.009	1362.61	.002	3068.93	.007
15. Scrapers & Mechanical Loaders	35206.81	.068	29339.89	.043	5866.92	.025
16. Electric Tram Equipment	23656.50	.046	25455.85	.038	1799.35	.008
17. Pumping Machinery	11595.99	.022	4823.40	.007	6772.59	.015
Total Underground Costs	1015776.11	1.962	1048903.02	1.539	33126.91	.423
<u>SURFACE COSTS:</u>						
18. Hoisting	43749.58	.084	50432.45	.074	6682.87	.010
19. Stocking Ore	9260.61	.018	8610.80	.012	649.81	.006
20. Screening-Crushing at Mine						
21. Dry House	10023.51	.019	11807.80	.017	1784.29	.002
22. General Surface Expense	12794.65	.025	12275.03	.018	519.62	.007
23. Maint: Hoisting Equipment	14812.84	.029	26455.27	.039	11642.43	.010
24. Shaft	5372.04	.010	4533.87	.007	838.17	.003
25. Top Tram Equipment	1791.97	.003	2810.93	.004	1018.96	.001
26. Docks, Trestles, & Pockets	4909.85	.010	2577.76	.004	2332.09	.006
27. Mine Buildings	1832.31	.004	4040.53	.006	2208.22	.002
Total Surface Costs	104547.36	.202	123544.44	.181	18997.08	.021
<u>GENERAL MINE EXPENSE:</u>						
28. Mining Engineering	4199.97	.008	3368.56	.005	831.41	.003
29. Mechanical & Electrical Engineering	2877.39	.006	2304.25	.003	573.14	.003
30. Analysis and Grading	18504.87	.036	20794.35	.031	2289.48	.005
31. Safety Department	2619.97	.005	2231.92	.003	388.05	.002
32. Telephones and Safety Devices	2701.13	.005	4375.38	.006	1674.25	.001
33. Local and General Welfare						
34. Spc. Exp., Pensions & Allowances	36173.01	.070	21744.38	.032	15428.63	.038
35. Ishpeming Office	11659.67	.022	12471.12	.018	811.45	.004
36. Mine Office	20841.06	.040	20272.01	.030	569.05	.010
37. Insurance	4752.94	.009	4765.50	.007	12.56	.002
38. Personal Injury	13788.32	.027	11667.24	.017	2121.08	.010
39. Social Security Taxes	20380.90	.039	20574.62	.030	193.72	.009
40. Employees Vacation Pay	17902.83	.035	20066.91	.030	2164.08	.005
Total Gen. Mine Expense	156402.06	.302	144636.24	.212	11765.82	.090
<u>COST OF PRODUCTION</u>						
41. Taxes	106103.23	.205	90130.55	.132	15972.68	.073
TOTAL COST	1382828.76	2.671	1407214.25	2.064	24385.49	.607

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8. COST OF OPERATING: (CONT.)

b. Detailed Cost Comparison: (Cont.)

(7) Detail of Accounts: (Cont.)

1. Exploring in Mine:

Covers a proportion of Geological Department expense. The amount charged to Athens Mine decreased \$157.85, while the cost per ton remained the same.

3. Development in Rock:

Total feet of drifting and raising in rock, 1902 feet in 1943 as compared with 1551 feet in 1942. Increase in expense \$5867.72 and in cost per ton .019. Drifting in 1943, 1592 feet; in 1942, 973 feet. Raising in 1943, 310 feet; in 1942, 578 feet.

4. Development in Ore:

There were 823 feet more ore drifting and 748 feet less ore raising in 1943. The increase in expense was \$2768.66 and in cost per ton .011.

5. Stopping:

The decrease in expense was \$61,207.23 and the cost per ton increased .011. Production decreased 163,934 tons. The increase in cost per ton was mainly due to an increase in wages of $5\frac{1}{2}$ cents per hour.

6. Timbering:

The increase in expense was \$11,377.49 and in cost per ton .188. The cost of timber, lagging, and poles, increased resulting in a higher cost per ton, while the raise in wages of $5\frac{1}{2}$ cents per hour increased the labor cost.

7. Tramming:

There was a decrease of 163,934 tons in production due to fire in the mine and a decrease in the number of shifts worked. In 1943 the mine operated one shift on Saturday, while in 1942 two shifts were worked. The decrease in expense was \$11,906.41 and the cost per ton increased .043.

8. Ventilation:

The increase in expense was \$1,084.53 and in cost per ton .007. The cost for electric power increased \$1,202.33 due to the new 80,000 cubic foot fan installed in 1942, operating the whole year as compared with only part of 1942.

9. Pumping:

Expense decreased \$1,743.86 and cost per ton increased .013.

Gallons of water pumped in 1943	- 195,041,792
Gallons of water pumped in 1942	- 204,553,558
Gallons decrease	9,511,766
Average gallons per minute in 1943	- 372
Average gallons per minute in 1942	- 388
Gallons decrease	16

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8. COST OF OPERATING: (CONT.)

b. Detailed Cost Comparison: (Cont.)

(7) Detail of Accounts; (Cont.)

9. Pumping: (Cont.)

The cost for electric power was \$171.00 less than in 1942 and for cleaning the sump \$619.44 less.

10. Compressors and Air Pipes:

Expenditures decreased \$9934.32 and cost per ton increased .007.
Cubic feet air compressed in 1943 - 1,013,220,000
Cubic feet air compressed in 1942 - 1,351,440,000
Decrease 338,220,000

Cost of electric power in 1943 - \$31,205.04
Cost of electric power in 1942 - 40,666.69
Decrease 9,461.65

11. Fire and Damage:

Expense in 1943 - \$12,694.00 Cost per ton .024.
Expense in 1942 - None

This covers the cost of fighting the fire and was incurred mainly in January 1943.

12. Underground Superintendence:

The increase in expense was \$3,985.90 and cost per ton .022. Increase was due to adding one more shift boss in 1943 and an increase in salaries of captain and shift bosses.

13. Cave-in:

Expense in 1943 - \$135.37, cost per ton .000.
Expense in 1942 - None

Expense in 1943 was for fencing to enclose extension of cave to the South and East.

14. Compressors and Power Drills:

The increase in expense was \$3068.93 and cost per ton .007. There were seven new RB-12 Ingersoll-Rand Jackhammer drill machines, three D.A. Drifter machines, one R-48 Wet Stoper machine, and eight Ingersoll-Rand Jack Legs bought in 1943 as compared with two new RB-12 Drill machines, and four Ingersoll-Rand Jack Legs in 1942. There were also more repairs to compressors.

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8. COST OF OPERATING: (CONT.)

b. Detailed Cost Comparison: (Cont.)

(7) Detail of Accounts: (Cont.)

15. Scrapers and Mechanical Loaders

The expense in 1943 increased \$5,866.92 and cost per ton .025. There were four new 25 H.P. Ingersoll-Rand Electric hoists costing \$7,360.00 and four Holcomb scrapers \$813.70 bought in 1943 as compared with one 20 H.P. Sullivan Electric hoist and two Holcomb scrapers purchased in 1942. There were 70,400 feet of scraper rope used as compared with 82,047 feet in 1942 due to smaller product. The cost of repairs to scraper and scraper hoists was larger in 1943 due to greater age of a number of the hoists.

16. Electric Tram Equipment:

The decrease in expense was \$1,799.35 while the cost per ton increased .008 due to smaller product.

Detail:

	<u>Generators</u>	<u>Locomotive</u>	<u>Wiring</u>	<u>M.L.Track</u>	<u>M.L.Cars</u>
1943	723.26	7114.22	1195.14	9259.78	5363.80
1942	873.70	8800.79	1911.10	9418.58	4651.68
Decrease	150.44	1686.57	715.96	158.80	
Increase					712.12

Decrease in expense to generators, locomotives, wiring, and main line tracks due to less repairs.

The increase in expenditures to main line cars due to more repairs. In 1943 eight cars were overhauled at the General Shops as compared with five in 1942.

17. Pumping Machinery:

Expenditures increased \$6,772.59 and cost per ton .015.

Increase in expense due to charging out the expenditures to E. & A. Account A.M.-12, sinking wells and installing pumps amounting to \$6,349.15.

SURFACE COSTS:

18. Hoisting:

	<u>Ore</u>	<u>Rock</u>	<u>Total</u>
Product 1943-Tons	517,814	22,485	540,299
Product 1942-Tons	681,748	20,690	702,438
Decrease-tons	163,934		162,139
Increase-tons		1,795	

Expenditures decreased \$6,682.87 and cost per ton increased .010. The electric power charge was \$7,184.58 less than in 1942. Wages increased 5½ cents per hour in 1943.

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8. COST OF OPERATING: (CONT.)

b. Detailed Cost Comparison: (Cont.)

(7) Detail of Accounts: (Cont.)

19. Stocking Ore:

Tons stocked in 1943 - 179,525
Tons stocked in 1942 - 225,797
Decrease - tons - 46,272

The decrease in expense was \$649.81 and cost per ton .006.

21. Dry House Expense:

The expenditures decreased \$1,784.29 and the cost per ton increased .002. The decrease in expense was due to extraordinary improvements in 1942. A concrete tank was built for taking care of drainage water from the dry house and a pump installed to pump the water into the mine discharge line. The dry house was also charged with a proportion of the cost of installing a booster pump on the city water main to increase the water pressure in the shower room at the dry house.

22. General Surface Expense:

Expense increased \$519.62 and cost per ton .007. The increase in expense was due to a 5 $\frac{1}{2}$ cents per hour increase in wages and to more expense removing snow.

23. Hoisting Equipment:

	<u>Electric</u> <u>Hoists</u>	<u>Hoisting</u> <u>Ropes</u>	<u>Skips and</u> <u>Skip Roads</u>	<u>Sheaves</u>
1943	3,459.23	2,852.25	7,915.70	585.66
1942	<u>10,567.52</u>	<u>6,905.67</u>	<u>7,656.32</u>	<u>1,325.76</u>
Increase			259.38	
Decrease	7,108.29	4,053.42		740.10

The decrease in expenditures was \$11,642.43 and cost per ton .010. The decrease in expense to electric hoists was due to extraordinary charges in 1942. The motor on skip hoist generator set burned out and had to be sent to Milwaukee for rewinding at a cost of \$3,450.00, besides the cost of taking it out and replacing it. New spiders for the skip hoist drum were authorized under E. & A. A.M-11, and the expense incurred, to December 31st, 1942., amounting to \$1500.74 was charged to hoisting equipment. The installation of these spiders was completed in January 1943 and the balance of \$829.42 to the E. & A. account was charged off in February 1943.

In 1943 two 1-3/8" skip ropes costing \$2,852.25 were charged out as compared with four 1-3/8" skip ropes and one 1 $\frac{1}{2}$ " cage rope in 1942.

The increase in expense to skips and skip roads was due to more repairs to the skips and for replacing runners in the circular portion of the shaft.

The decrease in expense for sheaves was due to replacing one of the head frame sheaves in 1942.

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8. COST OF OPERATING: (CONT.)

b. Detailed Cost Comparison: (Cont.)

24. Shaft:

There was an increase in expense of \$838.17 and cost per ton .903.

	<u>Steel Sets</u>	<u>U.G. Pockets</u>
1943	1,617.25	3,754.79
1942	1,410.82	3,123.05
Increase	206.43	631.74

There was more expense for repairs to steel sets and underground pockets.

25. Top Tram Equipment:

There was a decrease in expense of \$1,018.96 and cost per ton .001.

	<u>Engines & Motors</u>	<u>Wire Rope</u>	<u>Sheaves Rollers, Etc.</u>	<u>Tracks & Cars</u>
1943	230.52		334.84	1,226.61
1942	400.10	1,079.94	705.65	619.84
Decrease	169.58	1,079.94	370.81	
Increase				606.77

In 1943, 179,525 tons were stocked as compared with 225,797 tons in 1942. The increase in expenditures for tracks and cars was due to overhauling top tram cars and building one new car.

There was less repairs to engines and motors and a decrease in expenditures for sheaves, rollers and spools.

New top tram ropes were put on in the latter part of 1942 so that no replacements were necessary in 1943.

26. Docks, Trestles and Pockets:

The increase in expenditures was \$2,332.09 and in cost per ton .006.

Five bents of the old rock trestle was taken down in 1943 and new ones erected.

There was also more expense for replacing ties on the Northeast steel stocking trestle.

27. Mine Buildings:

The expenditures decreased \$2,208.22 and cost per ton .002.

		<u>1943</u>	
Office	36.75		Building storm shed
Warehouse	81.06		Building new loading platform
Shops	11.09		Repairing windows and doors
Shafthouse	279.77		Repairing and replacing sheeting
Engine House	170.71		Repairing brick work and painting floors
Heating Plant Bldg.	.39		Replacing window light
Dry House	692.43		Repairing brick work, enclosing water meter and alterations in fuse room
Timber tunnel	496.20		Replacing galvanized sheeting & repairing walls
Storage Bldg.	3.08		Repairing windows
Top Tram Bldg.	60.83		Replacing windows
Total	1,832.31		

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8. COST OF OPERATING: (CONT.)

b. Detailed Cost Comparison: (Cont.)

GENERAL MINE EXPENSE:

28. Mining Engineering:

Covers time and expense of mining engineer and helper.

The expense of this account increased \$831.41 and cost per ton .003.

29. Mechanical and Electrical Engineering:

The increase in expense to this account was \$573.14 and cost per ton .003

The charge to this account covers the time spent by mechanical and electrical department men on inspections and repairs.

30. Analysis and Grading:

	<u>Sampling at Mine</u>	<u>Central Laboratory exp.</u>	<u>Shipping Dept. Exp.</u>	<u>Trucking Samples etc.</u>
1943	4,574.79	9,662.14	3,309.19	958.75
1942	<u>5,078.49</u>	<u>11,638.42</u>	<u>3,223.87</u>	<u>853.57</u>
Increase			85.32	105.18
Decrease	503.70	1,976.28		

Determinations 1943 - 25,404 - cost per determination \$.380339

Determinations 1942 - 31,679 - cost per determination .367386

There was a decrease in expenditures to this account of \$2,289.48 and the cost per ton increased \$.005.

31. Safety Department:

	<u>First Aid Supplies</u>	<u>First Aid & Helmet Practice</u>	<u>Ishpeming Office Charge</u>
1943	684.61	171.60	1,763.76
1942	<u>291.43</u>	<u>69.41</u>	<u>1,871.08</u>
Increase	393.18	102.19	
Decrease			107.32

The expense to this account increased \$385.05 and cost per ton \$.002.

32. Telephones and Safety Devices:

Expenditures to this account decreased \$1,674.25 and cost per ton \$.001.

	<u>1943</u>	<u>1942</u>	<u>Increase</u>	<u>Decrease</u>
Lights at Shaft & Levels	2,103.91	3,817.76		1,713.85
Mine Telephone	232.50	208.38	24.12	
Safety Gates	29.18	216.80		187.62
Sign Boards & Signals	2,293.55	109.51	184.04	
Fire Equipment	41.99	22.93	19.06	

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8. COST OF OPERATING: (CONT.)

b. Detailed Cost Comparison: (Cont.)

34. Special Expense, Pensions and Allowances:

	<u>Legal</u>	<u>Saranac Investigation</u>	<u>Retirement</u>	<u>Wage Adjust- ment 1942</u>	<u>Other Expense</u>
1943	687.44	2364.09	1665.84	28,310.43	2692.71
1942	428.67	1933.42	1565.60		17816.69
Inc.	258.77	430.67	100.24	28,310.43	
Dec.					15123.98

There was an increase in expenditures of \$15,428.63 and cost per ton \$.038.

In the item of other expense there is included the payments made for wage adjustments of five and one-half cents per hour for hours worked from July 13th 1942 to January 1st, 1943. In 1942 this account included payments made for "Collar to Collar" time given underground employees in adjusting hours worked in excess of eight hours per day made necessary by the Wage & Hour Act.

35. Ishpeming Office:

Ishpeming office expense is pro-rated to various mines on basis of labor costs.

There was a decrease in expense of \$811.45 and the cost per ton increased \$.004.

36. Mine Office:

	<u>Salaries</u>	<u>Central Warehouse Exp.</u>	<u>Miscellaneous</u>
1943	14,893.57	4,460.95	1,486.54
1942	13,944.65	5,083.89	1,243.47
Increase	948.92		243.07
Decrease		622.94	

The increase in expenditures was \$569.05 and cost per ton .010. There was an increase in salaries in 1943.

37. Insurance:

	<u>Property</u>	<u>Group</u>	<u>Catastrophe</u>
1943	2,454.32	1,694.70	603.92
1942	2,379.00	1,641.99	610.26
Increase	75.23	52.71	
Decrease			6.34

The expense to this account decreased \$12.56 and the cost per ton increased \$.002.

38. Personal Injury:

	<u>Compensation and Doctors</u>	<u>Compensation Department</u>	<u>Hospital Loss</u>
1943	8,045.68	705.17	5,037.47
1942	6,252.67	718.57	4,696.00
Increase	1,793.01		341.47
Decrease		13.40	

There was a increase in expense to this account of \$2,121.08 and in cost per ton \$.010.

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8. COST OF OPERATING: (CONT.)

b. Detailed Cost Comparison: (Cont.)

39. Social Security Taxes:

	<u>Unemployment Insurance Tax</u>	<u>Old Age Benefit Tax</u>
1943	11,522.12	8,858.78
1942	11,661.01	8,913.61
Decrease	138.89	54.83

The decrease in expense was \$193.72 and the cost per ton increased \$.009.

The expense to this account is based on the amount of the payrolls.

40. Employees Vacation Pay:

The expense to this account decreased \$2,164.08 and the cost per ton increased \$.005.

In 1943 employees with three years service received one weeks vacation pay and those with ten years service received two weeks vacation pay. The employees worked during the vacation period and received vacation checks and regular checks on the pay day for the first half of August.

41. Taxes:

There was an increase in taxes levied of \$15,972.68 and in cost per ton \$.073. Tax rate per \$100 valuation in the City of Negaunee increased in 1943.

9. EXPLORATIONS AND
FUTURE EXPLORATIONS:

There was no diamond drilling on surface or in the mine in 1943 and none are contemplated in the immediate future. The ore body now being mined is fully developed and its boundaries determined.

10. TAXES:

	<u>1943 Valuation</u>	<u>1943 Taxes</u>	<u>1942 Valuation</u>	<u>1942 Taxes</u>
Realty (State Tax Commission)	2,310,000	88,055.35	2,270,000	74,177.24
Ore in Stock, Equip. Supplies)	440,000	16,772.45	455,000	14,868.13
Sterling Addition	4,600	175.35	4,600	150.31
Harvey Plat	1,300	49.55	1,300	42.49
Total	2,755,900	105,052.70	2,730,900	89,238.17
Collection fees		1,050.53		892.38
Total Opt. Athens Mine	2,755,900	106,103.23	2,730,900	90,130.55
<u>Rented Buildings:</u>				
Harvey Plat	5,700	217.29	4,400	143.78
Sterling Addition	23,700	903.46	23,700	774.46
Total	29,400	1,120.75	28,100	918.24
Collection Fees		11.21		9.18
Total Rented Buildings		1,131.96		927.42
Total Athens Iron Mining Co.	2,785,300	107,235.19	2,759,000	91,057.97
Total Taxes City of Negaunee		539,671.30		542,187.64
Tax Rate Per \$100.00 of Valuation		3.81192		3.267
Athens Iron Mining Co. Percent of Taxes		19.87		16.69

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10. TAXES: (CONT.)

The valuation of realty set by the State Tax Commission was increased \$40,000 in 1943. The valuation of personal property was decreased \$15,000 due to less ore in stock. The net increase in valuation was \$25,000. Due to higher tax rate in City of Negaunee taxes increased approximately \$16,000. The percentage of City of Negaunee taxes paid by the Athens Iron Mining Company was approximately 20% in 1943 as compared with 17% in 1942.

11. ACCIDENTS AND
PERSONAL INJURY:

The following table gives number and time lost from compensable accidents in the past six years.

	<u>1943</u>	<u>1942</u>	<u>1941</u>	<u>1940</u>	<u>1939</u>	<u>1938</u>
Fatal	0	0	0	1	0	1
Time lost - Over 4 months	4	2	1	1	0	1
- 1 to 4 months	4	9	7	4	5	3
- Less than one month	<u>18</u>	<u>5</u>	<u>10</u>	<u>5</u>	<u>3</u>	<u>1</u>
Total Accidents	26	16	18	11	8	6
Number of cases paid compensation for accidents prior to Jan. 1st each year	4	4	4	4	5	7
Number of cases paid difference in wages (included in above total.)	1	2	2	3	2	3

Nature and Classification of Compensable Accidents:

<u>Date</u>	<u>Remarks</u>	<u>Days Lost</u>
1-7-43	Laceration right knee	21
2-19-43	Fractured bone right hand	273 (still home)
2-23-43	Corneal ulcer left eye	12
3-17-43	Fracture 2nd finger right hand	3
3-23-43	Fracture pelvic bone	59
4-22-43	Compound fracture left leg	146 (still home)
4-26-43	Sprained back	20
5-8-43	Bruised left ankle and leg	12
4-14-43	Fractured bone right hand	0
5-26-43	Sprained left knee	58
6-3-43	Laceration 3rd finger right hand	0
7-9-43	" of scalp	15
7-9-43	Contused back	19
7-15-43	Fractured bone in foot	45
7-7-43	Contusion left shoulder	27
8-23-43	Bruised leg	14
8-13-43	" thighs	7
8-25-43	Fracture left arm	17
9-11-43	Fractured both bones right leg	112 (still home)
9-20-43	Fractured left ankle	103 " "
9-23-43	Laceration of right foot	20
11-2-43	Fractured left little toe	17
11-4-43	Contusion of back	14
11-2-43	Sprained left knee	6
12-9-43	Contusion right buttock	21
12-11-43	Fractured bone left foot	20

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11. ACCIDENTS AND
PERSONAL INJURY: (CONT.)

The accident record in 1943 was the highest in number of accidents for the past six years. However, there were no fatalities and 18 or about 70% of the accidents were slight causing a loss of time of less than one month. There was a large turn over of labor, the same as in 1942, and as a result many men with no experience in the mines were hired. The heavy operating schedule is also a factor affecting the accident rate as 1943 was the third year the mine has been operating the first five days of the week on a three-shift schedule. As in prior years falls of ground was the cause of the major number of the more severe accidents.

Close attention to safety was maintained during the year by the shift bosses and the mining captain. Instructions were given new men concerning the safe way to do various types of work and these men were watched until they had a good knowledge of the hazards.

12. NEW CONSTRUCTION
AND PROPOSED NEW
CONSTRUCTION:

Following is a list of E. & A's that were uncompleted at the end of 1942 and authorized in 1943.

E. & A. No. AM-8 - Purchase Six Holcomb Westeeco Scrapers:

	<u>Amount Authorized</u>	<u>Expended</u>		<u>Total</u>	<u>Unexpended</u>
		<u>1942</u>	<u>1943</u>		
6 Scrapers	1,200.00	408.77	813.70	1,222.47	22.47

This E. & A. was completed in May 1943. The estimated cost was exceeded by the freight charges which were omitted from the estimate.

E. & A. No. AM-12 - Sinking (3) Deep Wells:

	<u>Amount Authorized</u>	<u>Amount Expended</u>		<u>Total</u>	<u>Unexpended</u>
		<u>1942</u>	<u>1943</u>		
No. 1 Well	3,187.80	1,959.87	1,222.13	3,182.00	5.80
No. 2 Well	2,607.00	346.60	2,820.55	3,167.15	560.15
No. 3 Well	3,000.00	0	0		3,000.00
	<u>8,794.80</u>				

This E. A. can be considered as closed in July 1943. It is not planned to drill No. 3 Well at this time. Later additional test holes may be drilled to the West and perhaps a good location found for a deep well pump. A new E. & A. will be made at that time.

E. & A. No. AM-11 - Two Cast Iron Spider Skip Hoist Drums

	<u>Amount Authorized</u>	<u>Amount Expended</u>		<u>Total</u>	<u>Unexpended</u>
		<u>1942</u>	<u>1943</u>		
(2) Cast Iron Spiders	1,000.00	1265.31	-	1265.31	265.31
Installation	350.00	213.26	829.42	1064.85	714.85
Total	<u>1,350.00</u>	<u>1478.57</u>	<u>829.42</u>	<u>2330.16</u>	<u>980.16</u>

This E. & A. was completed in January 1943. The cost of installation was materially exceeded due to trouble in removing the old spiders and installing the new.

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12. NEW CONSTRUCTION
AND PROPOSED NEW
CONSTRUCTION: (CONT.)

E. & A. - No. AM-13 - Six 25 H.P. Scraper Hoists:

	<u>Amount Authorized</u>	<u>Amount Expended</u>	<u>Total</u>
Six 25 H.P. Scrapers			
Hoists at 1,840.00 each	11,040.00	11,040.00	11,040.00

This E. & A. was completed in August 1943.

E. & A. No. AM-14 - Purchase of One Mechanical Loader:

	<u>Amount Authorized</u>	<u>Amount Expended</u>	<u>Total</u>
One <u>Eimco</u> Findlay Loader	3,840.00	3840.00	3840.00

This E. & A. was completed in August 1943.

13. EQUIPMENT AND
PROPOSED EQUIPMENT:

a. Steam Shovels:

The Athens Iron Mining Company does not own a steam shovel. No. 43 shovel owned by the Cleveland-Cliffs Iron Company loaded the ore shipped from stockpiles in 1943. Rent for each day this shovel operated was paid by the Athens Iron Mining Company.

b. Scraper Hoists:

Following is a list of scraper hoist equipment at the mine:

<u>Company</u>		<u>Machines</u>	<u>1943</u>		<u>1942</u>		
			<u>Total Cost of</u>	<u>Each Mach.</u>	<u>Total Cost of</u>	<u>Each Mach.</u>	
			<u>Machines</u>	<u>Repaired</u>	<u>Repaired</u>	<u>Machines</u>	<u>Repaired</u>
Sullivan	15 H.P. Elec.	18	9	204.68	15	215.13	
"	20 H.P. Elec.	3	1	194.11	2	82.48	
"	25 H.P. Elec.	1	0		0		
Ing.-Rand	15 H.P. Elec.	6	3	158.82	2	79.95	
"	" 20 H.P. Elec.	7	4	155.50	7	129.40	
"	" 25 H.P. Elec.	4	0		0		
	<u>Total</u>	<u>39</u>	<u>17</u>	<u>162.51</u>	<u>26</u>	<u>157.28</u>	

Average cost of repair of the 34 in use in 1943 - \$186.41.
Purchased 1943 - 1-Eimco-Findlay Ore Loader.
Sold to Cambria-Jackson Mine - 4-Holcomb-Westeco Scrapers.

In 1943 six 25 H.P. Hoists were purchased, two of which were later sold to the Cambria-Jackson Mine. The four new hoists are all in service replacing some old 10 and 15 H.P. hoists that are under-powered and frequently have to be brought to surface for repairs. The new hoists have ample power and operate at higher speeds.

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13. EQUIPMENT AND
PROPOSED
EQUIPMENT: (CONT.)

c. Drill Machines:

Purchases in 1943 and 1942 are listed below.

<u>1943</u>	<u>1942</u>
7-RB-12-Ing. Rand Auger Drill Mach.*	2-RB-12 Ing.Rand Auger Drill Mach.
3-D.A.-35 Inger.-Rand Drifter " "	
1-D.A.-48 Ing.-Rand Stoper " "	
8-Jack Legs	4-Jack Legs

(*) One sold to Cambria-Jackson Mine.

As the old drill machines wear out they are being replaced with new modern machines that are vastly superior in performance.

d. Motor Haulage: Cars:

A number of the underground haulage cars are badly in need of repairs. Eight were sent to the General Shops at Ishpeming and repaired but due to press of work at the shops it was impossible to divert men to do this work in the latter months of the year. Preparations are now under way at the mine for overhauling the cars until the Ishpeming Shops are able to do this work again. Some repairs are made in the mine such as changing wheels, new catches, etc., but at least every two years the cars have to be brought to surface for installation of new plates, re-riveting, etc. The cost of repairs was \$5,363.80 in 1943 as compared with \$4,651.68 in 1942.

e. Timber Hoists:

During the year, four 6 H.U. Utility Hoists were purchased, two of which were sold to the Cambria-Jackson Mine. The older timber hoists are being scrapped as they wear out and are replaced with the new hoists that are more powerful and operate at higher speeds.

14. MAINTENANCE
AND REPAIRS:

a. Steel Trestles:

There were no repairs to the steel work of the stocking trestles in 1943. A number of ties were replaced on the Northeast steel stocking trestle and some long ties or decking on the permanent steel trestles. The guard railing on the permanent trestles was also repaired in 1943.

b. Comparison of Costs - 1943 with 1942:

Maintenance and repairs listed under underground costs:

	<u>Amount</u>	<u>Cost per Ton</u>
1943	74,800.84	.144
1942	<u>60,981.75</u>	<u>.090</u>
Increase	13,819.09	.054

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b. Comparison of Costs - 1943 with 1942: (Cont.)

Maintenance and repairs listed by the four accounts as shown on the Cost Sheet:

	<u>1943</u>	<u>1942</u>	<u>Increase</u>	<u>Decrease</u>
Comp. & Power Drills	4,431.54	1,362.61	3,068.93	
Scraper Equipment	35,206.81	29,339.89	5,866.92	
Elec. Tram Equipt.	23,656.50	25,455.85		1,799.35
Pumping Machinery	11,505.99	4,823.40	6,682.59	
Total	<u>74,800.84</u>	<u>60,981.75</u>	<u>13,819.09</u>	

Purchases 1943:

Power Drills: 7-RB-12 Drill machines \$1,404.23;
3-DA-35 Machines \$1,265.93,
1-R-48 Stoper \$366.32
3-Jack Legs \$646.42

Scraper Hoists and Scrapers:

4-25-H.P. Ing.-Rand Electric Hoists \$5,880.00
4-Holcomb-Westeco Scrapers \$814.08

Pumping Machinery:

E. & A. No. AM-12 Deep Well Holes and pumps
\$6,349.15 charged out in 1943.

Maintenance and repairs listed under surface costs:

	<u>Amount</u>	<u>Cost Per Ton</u>
1943	28,719.01	.056
1942	<u>40,418.36</u>	<u>.060</u>
Decrease	11,699.35	.004

Maintenance and repairs listed in the five accounts as shown on the Cost Sheet:

	<u>1943</u>	<u>1942</u>	<u>Increase</u>	<u>Decrease</u>
Hoisting Equipment	14,812.84	26,455.27		11,642.43
Shaft	5,372.04	4,533.87	838.17	
Top Tram Equipment	1,791.97	2,810.93		1,018.96
D. T. & Pockets	4,909.85	2,577.76	2,332.09	
Mine Buildings	<u>1,832.31</u>	<u>4,040.53</u>		<u>2,208.22</u>
Total	<u>28,719.01</u>	<u>40,418.36</u>		<u>11,699.35</u>

Costs were lower in 1943, account of extraordinary expense for repairs to hoisting equipment in 1942 due to rewinding motor on the Ignor Generator Set.

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15. Power:

Detail of electric current purchased compared with 1942:

	<u>1943 - 12 Mos. Optg.</u>		<u>1942 - 12 Mos. Optg.</u>	
	<u>Cost</u>	<u>Per Ton</u>	<u>Cost</u>	<u>Per Ton</u>
Stopping	3,217.84	.006	2,786.21	.004
Ventilation	8,405.41	.016	7,203.08	.011
Pumping	22,336.60	.043	22,507.60	.033
Hoisting	29,291.14	.057	36,475.72	.054
Stocking Ore	824.20	.002	885.78	.001
Dry House	762.19	.001	756.14	.001
Lights at Levels	881.62	.002	2,162.94	.003
Compressor	31,205.04	.060	40,666.69	.060
Electric Haulage	2,845.05	.005	3,812.85	.006
Shops	350.94	.001	310.93	.000
Heating Plant	16.43	.000	16.09	.000
Office	30.71	.000	27.85	.000
Storage Battery Loco.	29.11	.000	33.77	.000
Surface Lights	394.32	.001	208.95	.000
Total	100,591.60	.194	117,854.60	.173
Main Line Meter - K. W.	7,536,000		8,946,701	
Separate Meter Readings	7,356,987		7,773,487	
Line Loss	179,013		173,214	
Product	517,814		681,748	
K. W. Per Ton (Inc. Line Loss)	14.553		13.12	
Cost Per K.W. (Avg.)	.01334814		.01317296	
15 Min. Demand (Avg.)	1407		1585	
Load Factor (Avg.)	61.2%		64%	

The decrease in product accounts for decrease of 1,410,000 kilowatt hours in current used in 1943. The cost per kilowatt hour increased due to the less favorable load factor.

17. CONDITION OF PREMISES:

The grounds around the mine buildings were kept in good condition during the growing season. The grade of the parking lot for automobiles across the street from the office was improved by filling the low spots with cinders. All wood and rock was removed from the stocking grounds after the ore was loaded.

b. Athens Mine Houses:

The following statement gives the total cost of repairs and the average cost per house for 1943 and 1942:

<u>Year</u>	<u>No. Houses</u>	<u>Amount Repairs</u>	<u>Avg. Cost Per House</u>	<u>Rental Income</u>	<u>Taxes on Rented Bldgs.</u>	<u>Net Income</u>
1943	30	3,013.20	100.44	5,053.85	1,131.96	908.69
1942	31	4,459.49	143.85	5,049.13	927.42	337.78

One Company house located on ground involved in the cave to surface was sold and removed by the purchaser, reducing the number of houses owned to 30. All of the houses have now been overhauled and put in good repair and for the next several years the cost of repairs should be nominal.

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18. NATIONALITY OF
EMPLOYEES:

The following statements show, first, the nationality by parentage, and secondly, a separation of nationalities into American and foreign born.

<u>As to Parentage</u>	<u>1943</u>	<u>Percent</u>	<u>1942</u>	<u>Percent</u>
Finnish	161	40.1	171	40.8
Italian	72	17.9	70	16.7
English	62	15.4	66	15.8
French (Canadian)	46	11.5	43	10.3
Swedish	31	7.7	33	7.9
French (France)	1	.2	1	.2
Scotch	1	.2	4	.9
German	7	1.8	7	1.7
Austrian	5	1.2	7	1.7
Norwegian	7	1.8	7	1.7
Irish	4	1.0	3	.7
Greek	1	.2	1	.2
Danish	0		2	.5
Polish	2	.5	3	.7
Yugoslavian	2	.5	1	.2
Total	<u>402</u>	<u>100.0</u>	<u>419</u>	<u>100.0</u>

<u>As to Birth</u>	<u>American Born</u>		<u>Foreign Born</u>	
	<u>1943</u>	<u>1942</u>	<u>1943</u>	<u>1942</u>
Finnish	115	122	46	49
English	52	54	10	12
Italian	36	34	36	36
French (Canadian)	45	42	1	1
Swedish	25	29	6	4
French (France)	1	1	0	0
Scotch	1	4	0	0
German	7	7	0	0
Austrian	4	5	1	2
Norwegian	7	7	0	0
Irish	4	3	0	0
Greek	0	0	1	1
Danish	0	2	0	0
Polish	2	3	0	0
Yugoslavian	2	1	0	0
Total	<u>301</u>	<u>314</u>	<u>101</u>	<u>105</u>
	74.9%	74.9%	25.1%	25.1%

CAMBRIA-JACKSON MINE
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1. GENERAL:

The Cambria-Jackson Mine located adjacent to Teal Lake in the city of Negaunee was operated by the Republic Steel Corporation until June 1st, 1943, when it was transferred to the Cleveland-Cliffs Iron Company. The cost of operation for the month of May was charged to the Cleveland-Cliffs Iron Company so that the transfer as far as operating cost was concerned was effective as of May 1st, although actual operation did not start until June 1st. The mine worked seventeen shifts per week, three shifts for the first five days of the week and two shifts on Saturday while operated by the Republic Steel Corporation. On June 12th, shortly after the transfer, the Saturday afternoon shift was eliminated in order to bring the operating schedule to sixteen shifts per week, in line with the other mines operated by the Cleveland-Cliffs Iron Company, also, to provide more time for sending down timber, lagging, and poles. An increased amount of timber was required in the mine due to the change from the sub-level caving to the top slicing system of mining. As more gangs started to mine by the top slicing system it became apparent that with the poor facilities for sending timber underground it would soon be necessary to eliminate the midnight shift and devote this shift five days per week to sending down timber. The midnight shift was therefore eliminated on July 3rd, and since July 6th, the mine has operated two eight hour shifts the first five days of the week and one shift on Saturday or a total of eleven shifts per week.

It was evident on taking over the mine that many changes would have to be made to bring it in line with other Cleveland-Cliffs Iron Company properties as regards efficiency of operation, condition of equipment, etc. This work has been underway the past seven months and is still uncompleted. The many changes will be discussed in detail under various headings later in this report. Brief comments are made in this section of the report regarding the most important.

The change in method of mining from sub-level caving to the top slicing system affected the general operation in a number of ways. A few of these are listed herewith: Increase in amount of timber required and change in length of stull timber from seven and eight feet to nine feet; rebuilding cages to handle longer timber; change in operating schedule in order to get timber into the mine; timber and lagging railroad tracks installed on surface for unloading and stocking the largely increased amount of timber required; grading and making a timber yard; cleaning up and utilizing the stock of seven and eight foot timber on hand when the mine management changed which was accomplished by borrowing the portable sawmill from the Negaunee Mine for a period of four months. Purchase of new equipment to increase efficiency, comprising timber hoists, drill machines, jacks legs, scraper hoists, and building of fifteen scrapers designed like the ones in use at the Negaunee Mine. Heavy development program in the mine to provide raises for each mining contract to eliminate the transfer drifts used extensively by the former operators.

To get a picture of one of the problems arising since the change in management, it is necessary to call attention to the poor condition of the equipment at the mine. Apparently the former operators knew for a considerable length of time that the transfer was being considered and neglected ordinary and necessary repairs. To mention only a few: Haulage equipment in the mine, Larry cars used for stocking ore on surface, heating boiler in dry house, drill machines and scraper hoists, mine truck and tractor, motor on generator for underground haulage set, skips and cages, building repairs and many others.

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1. GENERAL: (CONT.)

One result of the change in management has been the elimination of at least 90% of the wet ore. This has been accomplished by drainage ditches on the sub-levels, pipe lines to carry the water in the raises, by cutting out raises at the point where water was encountered and drifting a short distance to catch the water, and by providing individual raises for a number of contracts that formerly had dry ore contaminated by water on the transfer sub-levels.

On taking over the mine, it was decided to replace the Mining Captain and the mine mechanic and after observation and study of the other bosses to make further changes if the men were not qualified for the jobs. The Mining Captain was replaced by an Underground Foreman from the Negaunee Mine and the mine mechanic by a mechanic from the Athens Mine. It might be of interest to add that the new Captain was a son of John Tregonning, former Captain at the Athens Mine and the new mechanic a son of William Bath, former Captain at the Gardner-Mackinaw Mine. Both of these young men are in their early thirties and were advanced to responsible jobs due to the good showing they had made in their former jobs. Two changes were made later, the surface foreman being replaced with a man with past experience at our mines and the Underground Foreman under the Republic Steel Corporation management demoted to a miners job. Two of the five shift bosses were retained as regular shift bosses and the other three as trammer bosses. The latter three rotate on a three shift schedule as it is necessary to have a boss on the midnight shift to supervise the crew that take timber off the cage and distributes it to the mining contracts. There has been excellent cooperation on the part of the men retained on the supervisory jobs.

The three most **important** improvements undertaken on surface were the addition to dry house and conversion of the old dry house to the Cleveland-Cliffs Iron Company standard arrangement, to enclosing of the shaft house, rebuilding the railroad loading pocket, repair of steel members supporting the shaft house and pockets; and to enlarging, grading, and laying a ten inch rock fill on the stocking grounds. Each of these jobs proved more extensive than was anticipated and none were entirely completed at the end of the year. The expense will be much in excess of the amount estimated but the results will warrant the expenditure. The steel shaft house was in very bad condition due to rusting of the steel members and extensive repairs are underway to make it serviceable and safe for continued use during the life of the property.

The shaft in use at the mine is known as the Hartford No. 2. It is 17 feet in length by 5 feet in width and has two skip compartments and a pipe and ladder road compartment. A small cage approximately 4 feet by four feet inside dimensions is suspended on the hoist ropes above each of the skips. The cage holds twelve men and six to seven trips are required to take the day shift crew underground. Only a limited amount of supplies can be sent underground on each trip of the cage, as all the timber, lagging, poles, plank, drills, etc., have to be stood on end on the cage. The standard cage at the Company mines is approximately six feet wide and ten feet long. Loaded timber trucks are run on the cage sent underground and conveyed by motor to the raises where they are unloaded and the timber later hoisted to the contracts on the sub-levels.

CAMBRIA-JACKSON MINE
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1. GENERAL: (CONT.)

There are only two handlings in the entire operation, loading in the timber field, and unloading in the mine. At the Cambria-Jackson Mine, automobile trucks are loaded in the timber field, unloaded at the shaft, the timber moved by air power to the cage, sent underground, taken off cage by air power, laid on floor of mine plat, loaded by hand on timber trucks, and hauled by motor to raises. A total of five or more handlings as compared with two at the other Company mines. There is only one way in which this time consuming operation can be improved and that is by providing a standard cage road either by enlarging of the Hartford No. 2 Shaft or by sinking No. 1 Hartford Shaft now 600 feet deep to the 7th Level. Enlargement of the present operating shaft is out of the question for the duration of the war, but further study of the cost, etc., of sinking No. 1 Hartford shaft to the 7th Level and re-arrangement of the compartments in the present 600 feet of shaft is warranted. The saving in time and in labor cost also the increase in hoisting capacity, (a three shift operation would then be possible and also a larger skip) indicates that a large expenditure is justified.

When the Company took over the mine there was no checking system in use. Under the Wage & Hour Law it is necessary to check employees in and out of the mine in order to avoid possible claims for over time. The men are considered to be working from the time they receive their checks until they turn them in again at the end of the shift. The plan in effect at the Company mines calls for check boards under glass doors that are kept locked except when in use and a special employee to give out and receive the checks, make up reports showing the men working, etc., These reports are also used to check the time turned in by the shift bosses. A small building was moved near the shaft and used as temporary quarters for checking until the check room in the addition to the dry was completed in October. Schedules were prepared and posted in the dry house giving the time that each cage load of twelve men would leave the surface and the time each cage left underground. The actual time set for each cage load of twelve men was approximately seven hours and 58 or 59 minutes. This allows a minute or more for possible delays before the eight hour period is exceeded.

Mine supplies constituted a problem with the change of management. No inventory of supplies on hand was available and in many instances no bills showing cost and date of purchase could be located. The Republic Steel Corporation accounting system calls for most supplies to be charged out when received at the mine while under the Cleveland-Cliffs Iron Company system, supplies are charged out as used. Large quantities of new and second-hand material had been shipped in from Republic Steel Corporation mines abandoned on other ranges that never would be used at the mine. A supply inventory was started as soon as possible and when completed, settlement was made for supplies in regular use at the mine. The Republic Steel Corporation took some supplies from the mine laboratory to the Tobin Mine together with other equipment that by arrangement was not included in the transfer. Some of the surplus supplies at the mine were transferred to the General Storehouse. The warehouse room is attached to the office building and after removal of a portion of the surplus stock this room was re-arranged, new shelving, bins, and counters installed, the walls and floors painted, and the entire stock of supplies re-arranged in convenient position for inspection, checking and handling.

CAMBRIA-JACKSON MINE
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1. GENERAL: (CONT.)

The production since June 1st has varied from month to month as was to be expected. Mining was largely by the old sub-level caving system in June when the largest hoist was obtained. A large decrease occurred in July, August and September due to change to the top slicing system and to elimination of one operating shift five days per week. A recovery started in October and in November most of the decrease had been eliminated and the product was back to nearly 25,000 tons per month, which is about normal until the present development program is further advanced. The product decreased in December due to raises out of commission, to accidents to equipment, and to loss of time by employees in the holiday season near the end of the month.

The product for the year was 276,924 tons. This total was divided 129,224 tons produced by the Republic Steel Corporation to June 1st and 147,700 tons by the Cleveland-Cliffs Iron Company from June 1st to December 31st. Shipments were 234,890 tons or 42,023 tons less than the product for the year. At the end of 1943 there were 72,504 tons of ore on hand.

During the seven months the mine has been under the Cleveland-Cliffs Iron Company management there were twelve compensable accidents. Three of these caused serious bone fractures the balance were slight and all the men involved have returned to work. This seven month transition period with change in management, change in system of mining, and heavy construction program on surface increased the hazards. It was not possible to immediately install all the protective devices and teach the men the standards set up for mining by the top slicing system. It is gratifying to report that cooperation by the men has been excellent.

There was only one feeder line to the engine house from the Cliffs Power and Light sub-station, located on Jackson property approximately 2,000 feet Southeast of the mine. The wires were not large enough to carry the current required and there was a decided drop in voltage during the peak load periods. This situation was corrected by installation of another circuit on the pole line since which time there has been ample current available and constant voltage.

After the spring thaw and also after heavy rainfall the surface water in a considerable area from one-quarter to one-half mile West of the mine finds its way into several caves to surface on the old Cambria and Lilly property that connect directly with the mine workings. In the past the mine water has more than doubled in the spring and summer for short periods of time and several of the mining areas have been quite wet for a month or more. A study of the conditions as regards surface drainage and cross-sections of the surface made from levels run across the area showed that one main ditch with a number of laterals would divert the greater part of the water from the caves. A small revolving steam shovel on crawler tracks was used in digging the drainage ditches, the work was started in September and completed late in October. The results of this work will be watched very closely at the time of the spring break-up in March and April 1944.

There were hardly any lights on surface on June 1st and one of the first tasks undertaken was installation of an adequate system for lighting the mine during the hours of darkness. Lights were also installed in buildings as a protective measure to prevent sabotage. Bare copper wires on poles constituted a hazard and they were replaced with cables laid below

CAMBRIA-JACKSON MINE
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1. GENERAL: (CONT.)

the surface and the old pole lines removed. This resulted in a decided improvement in the appearance of the surface plant.

On taking over the mine it was found that only one policeman was employed. This arrangement did not provide police protection after midnight. A police force of four men was organized which provides 24 hour supervision. In addition to providing protection from fire and theft, the police assist with checking men in and out of the mine, with the orderly parking of automobiles and in keeping strangers off the property unless they have passes.

Due to lack of data necessary for comparison with the previous years' operation, which if available would be of little value as the mine was operated under the management of another company, the first annual report will be in large measure merely a history of the seven months operation by the Cleveland-Cliffs Iron Company.

2. PRODUCTION
SHIPMENTS AND
INVENTORIES:

a. Production by Grades:

	<u>Cleveland-Cliffs Iron Co.</u> <u>7 Months</u>	<u>Republic Steel</u> <u>5 Months</u>	<u>Total</u> <u>12 Months</u>
Cambria Lease Ore	1,153	11,910	13,063
Jackson Strip Ore	146,547	117,314	263,861
Rock	7,813	1,707	9,520
Total Hoist	155,513	130,931	286,444

b. Shipments:

	<u>Pocket Tons</u>	<u>Stockpile Tons</u>	<u>Total Tons</u>
Cambria Lease	542	18,977	19,519
Jackson Strip	104,017	111,354	215,371
Total	104,559	130,331	234,890

c. Stockpile Inventories:

	<u>Dec. 31, 1943</u>	<u>Dec. 31, 1942</u>	<u>Increase</u>	<u>Decrease</u>
Cambria Lease	566 tons	7,022 tons		6,456 tons
Jackson Strip	71,938 tons	23,447 tons	48,491 tons	
Total	72,504 tons	30,469 tons	42,035 tons	

d. Division of Product by Levels:

	<u>5 Months</u> <u>Republic Steel</u>	<u>7 Months</u> <u>Cleveland-Cliffs Iron Co.</u>	<u>Total</u>	<u>Percent</u>
6th Level	22,073	21,724	43,797	15.8%
7th Level	107,151	125,976	233,127	84.2%
Total	129,224 Tons	147,700 Tons	276,924 Tons	100.0%

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2. PRODUCTION
SHIPMENTS AND
INVENTORIES: (CONT.)

e. Production by months:

Month	Cambria Lease	Jackson Strip	Total Ore	Rock
January	8,190	21,169	29,359	398
February	1,603	19,803	21,406	235
March	2,117	23,505	25,622	348
April	-	25,653	25,653	502
May	-	27,184	27,184	224
Total Republic Steel	11,910 Tons	117,314 Tons	129,224 Tons	1,707 Tons
June	-	25,997	25,997	317
July	-	16,319	16,319	1556
August	340	17,115	17,455	1380
September	113	19,192	19,305	1416
October	429	23,378	23,807	772
November	-	24,229	24,229	832
December	271	20,317	20,588	1540
Total Cleveland-Cliffs	1153 Tons	146,547 Tons	147,700 Tons	7813 Tons
Grand Total	13,063 Tons	263,861 Tons	276,924 Tons	9520 Tons

f. Ore Statement:

	Cambria Lease	Jackson Strip	Total
On Hand Jan. 1st, 1943	7,022 Tons	23,447 Tons	30,469 Tons
Product for year	13,063 "	263,862 "	276,925 "
Total	20,085 "	287,309 "	307,394 "
Shipments	19,519 "	215,371 "	234,890 "
Balance on Hand	566 "	71,938 "	72,504 "
Increase ore on Hand		48,491 "	42,035 "
Decrease Ore on Hand	6,456 "		

g. Delays:

1942	Five 3-8 Hour Shifts and 2-8 Hour Shifts		
1943	Five 3-8 Hour Shifts and 2-8 Hour Shifts 1/1/43 to 6/12/43		
	Five 3-8 Hour Shifts and 1-8 Hour Shifts 6/12/43 to 7/6/43		
	Five 2-8 Hour Shifts and 1-8 Hour Shifts 7/6/43 to 12/31/43		
June 14th:	6 $\frac{1}{2}$ hours delay.	Loss of Product	140 tons
	Replacing broken slip ring on skip-hoist motor.		
June 18th:	3 $\frac{1}{2}$ hours delay.	Loss of Product	150 tons
	Replacing broken steel liner on head frame sheave.		
June 21st:	2 $\frac{1}{2}$ hours delay.	Loss of Product	120 tons
	Larry car on landing out of commission.		
June 29th:	1 $\frac{1}{2}$ hours delay.	Loss of Product	50 tons
	Larry car off track on landing.		
July 9th:	1 $\frac{1}{2}$ hours delay.	Loss of Product	75 tons
	Broken air line in mine.		

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2. PRODUCTION
SHIPMENTS AND
INVENTORIES: (CONT.)

g. Delays: (Cont.)

There was a 1½ hour delay on July 13th account of one hour's trouble with resistors in the engine house, and one half hour with the larry car off track on landing. The loss of product was 100 tons.

There was a 4½ hour delay on July 15th, 3-1/2 hours replacing a broken stringer on the shaft, and one hour repairing the skip. The loss of product was 200 tons.

There was a 1 hour and 35 minute delay on July 16th; one hour account of the larry car off track on landing, and 35 minutes repairing the hoist motor. The loss of product was 80 tons.

There was a 2 hours and 20 minutes delay on July 20th; 40 minutes account of the contacts on the hoist motor in the engine house, and 1-1/2 hours replacing runner in shaft house. The loss of product was 85 tons.

There was 1-1/2 hours delay on July 27th account of larry car repairs. The loss of product was 70 tons.

There was 3/4 hour delay on August 2nd account of replacing a burned coil on the switch panel of ore hoist. The loss of product was 50 tons.

There was a 1-1/2 hour delay on August 12th account of the larry car off track on landing. The loss of product was 70 tons.

There was a 2-1/4 hours delay on August 24th while replacing a broken runner at the 7th level pocket. Loss of product was 110 tons.

There was a 1-1/3 hours delay on August 31st while changing a broken sheave on pulley stand. The loss of product was 60 tons.

There was a 1-1/3 hours delay on September 4th account of repairing the skip. Loss of product was 60 tons.

There was a 3 hours and 35 minutes delay on September 28th; 3 hours repairing the larry car and 35 minutes repairing the skip runner at dump in the shaft house. The Loss of product was 125 tons.

There was a 7 hours delay on November 11th account of trestles not being ready, stocking ore until 4 p.m. Loss of product was 450 tons.

There was a 3-1/2 hours delay on November 15th. The skip dump was out of commission account of frozen ore. The loss of product was 50 tons.

There was a 5 hour delay on November 16th account of a broken stringer at skip dump and broken door catches on the larry car. The loss of product was 400 tons.

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2. PRODUCTION
SHIPMENTS AND
INVENTORIES: (CONT.)

g. Delays: (Cont.)

There was 9-1/2 hours delay on December 16th account of the motor on the larry car burned out. Loss of product was 680 tons.

There was 6 hours delay on December 17th account of the larry car being out of commission. Loss of product was 143 tons.

There was 3 hours delay on December 21st because the larry car was out of commission. Loss of product was 300 tons.

There was 3-1/4 hours delay on December 22nd; 1 hour to repair wearing shoe on skip, and 2-1/4 hours to repair bell signals that were out of commission. Loss of product was 100 tons.

There was 2 hours delay on December 23rd account of trouble with the skip hoist motor. Loss of product was 75 tons.

The total loss of product from the 24 delays listed above amounted to 3,743 tons. The actual loss of product was not large but the number of delays was unusual. Many were caused by breakdowns of equipment that will be eliminated in the future. There had not been time to make the improvements and necessary repairs to avoid a number of the delays. Difficulty in obtaining material and parts ordered, due^{to} war time restrictions, was a factor in delaying repairs, as was also the labor shortage.

h. Delay Due to Lack of Current:

There was a 50 minute delay on August 13th due to the voltage being low. The loss of product was 60 tons.

3. ANALYSIS:

a. Average Mine Analysis on Output:

<u>Grade</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Sulphur</u>
Cambria-Jackson	276,924	58.22	.077	10.59	0.7

0.7 - .17?

b. Average Mine Analysis on Straight Cargoes:

All ore shipped was mixed with other grades.

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4. ESTIMATE OF
ORE RESERVES:

a. Developed Ore:

Assumption: 12.75 cubic feet equals one ton
10% deducted for rock
10% deducted for loss in mining
Percentage of Bessemer---None

<u>Area</u>	<u>Cambria</u>	<u>Jackson</u>	<u>Total Stand. Ore</u>	<u>High Sul. Ore</u>
Above 6th Level	2,667	468,594	471,261	
Between 6-7th Levels	7,875	1,403,019	1,410,894	246,140
Below 7th Level				79,792
Tot. Gross Nov. 30, 1943	10,542	1,871,613	1,882,155	325,932
Less 10% Loss in Mining	1,054	187,161	188,215	32,593
	9,488	1,684,452	1,693,940	293,339
Less 10% for Rock	949	168,445	169,394	29,334
	8,539	1,516,007	1,524,546	264,005
Less December Product	271	20,317	20,588	
Net Tot. December 31, 1943	8,268	1,495,690	1,503,958	264,005
<u>Total Developed Ore:</u>	<u>Cambria</u>	<u>Jackson</u>	<u>Total</u>	
1942 Republic Steel Estimate	30,155	1,174,508	1,204,663	
Decrease - 1943	21,837			
Increase - 1943		321,182	299,295	

The ore estimated at this mine is divided between the Cambria Lease and the Jackson Strip. The product in 1943 was 276,924 tons which amount must be added to the increase in ore reserves shown at the end of 1943 making a total of 576,219 tons developed in 1943. This increase is based on estimates made by the Republic Steel Corporation in 1942 and by the Cleveland-Cliffs Iron Company in 1943. It shows that the Republic Steel Corporation estimate was ultra conservative and did not represent the actual ore developed in December, 1942. A portion of the increase is above the 6th Level but the greater amount was between the 6th and 7th Levels in the area termed the "South West Riser".

Including probable ore (approximate estimate) 500,000 tons in the developed portion of the mine and ore that may be found on the North 1/2 of the Northeast 1/4 of Northeast 1/4 of Section 2-47-27, the West forty of the Jackson Strip, there is a possibility of developing over 1,000,000 tons of additional ore. This would make a total of approximately 2,500,000 tons, which, based on a product of 300,000 tons per year indicates a life of eight years or more for the mine.

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4. ESTIMATE OF
ORE RESERVES:

c. Expected Average Natural Analysis:

<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss</u>	<u>Moist.</u>
1,503,958	52.19	.074	5.93	.17	2.22	.53	.22	.015	1.58	12.50

d. Ore in Stock: Average Natural Analysis:

Cambria-Jackson Ore:

<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss</u>	<u>Moist.</u>
72,504	51.10	.075	9.57	.19	2.24	.58	.27	.013	1.50	11.93

5. LABOR AND
WAGES:

a. Comments:

There were 222 employees on June 1st, 1943, when the Cleveland-Cliffs Iron Company assumed the management of the mine and on December 31st, 1943, 226 men, an increase of four men in seven months.

The heavy improvement and repair program made it necessary to hire carpenters and to have special men temporarily transferred from other mines. Most of this unusual labor expense was charged to E. & A. CC-119. The change in working schedule from 3-8 hour shifts to 2-8 hour shifts released men in the mine that were retained for other jobs that developed on account of the change in the mining system, also additional miners were provided for the new gangs that were organized. During the seven months period five men were drafted and enlisted in the armed service, seven men were transferred to other mines, two men were discharged, one man died, and nineteen men quit to work elsewhere, making a total loss of thirty-five men. During this period thirty-nine men were hired, making a net gain of four men. With the completion of the work of repairing the shaft house and various building jobs which are still underway, the number of employees will be reduced by a few men. At the end of the year there was a shortage of ten men in the mine and this shortage will increase with the loss of young men 18 to 22 years of age who will be inducted into the armed service in the next several months.

When the Company took over the mine the employees had already chosen the C. I. O. Union as their bargaining agent but a contract had not been signed with the Republic Steel Corporation. A contract identical with the contracts in force at other Cleveland-Cliffs Iron Company mines was signed in July by the union and Company representatives. Several grievances have been presented by the union and with one exception have been settled in the lower steps. One case will doubtless be taken up with the manager, which is known as the third step. The situation at this mine is radically different from

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5. LABOR AND
WAGES:

a. Comments: (Cont.)

that at the mines operated for years by the company. There is not the same feeling among the men and by the men towards the bosses that exist in the other company mines. However this condition can be broken down in time by fair treatment except in the case of a few radicals who will not respond to any treatment except force. In taking over an operating mine, it is necessary to take the men as you find them, a mixture of excellent and poor workmen, some misfits, and a number that have been injured while working for the former company. The majority however are good workmen and all the men welcome the change in management. They are grateful for the many improvements made, especially in the dry house and also for the change in the mining system which they realize reduces the mining hazard.

b. Comparative Statement of Wages and Product:

6/1/1943 to 12/31/1943

<u>PRODUCT:</u>	147,700
No. Shifts and Hours	1-8 32
	2-8 124
	3-8 24
<u>AVERAGE NO. MEN WORKING:</u>	
Surface	62
Underground	150
Total	212
<u>AVERAGE WAGES PER DAY:</u>	
Surface	7.11
Underground	7.85
Total	7.63
<u>AVERAGE WAGES PER MONTH:</u>	
Surface	163.42
Underground	182.65
Total	177.80
<u>PRODUCT PER MAN PER DAY:</u>	
Surface	14.57
Underground	6.05
Total	4.27
<u>LABOR COST PER TON:</u>	
Surface	.488
Underground	1.298
Total	1.786
<u>AVERAGE PRODUCT MINING:</u>	
Stoping	17.53
Development in Ore	3.94
Total	16.63
<u>AVERAGE WAGES CONTRACT LABOR:</u>	8.50
<u>TOTAL NUMBER OF DAYS:</u>	
Surface	10,138 $\frac{1}{2}$
Underground	24,424 $\frac{1}{4}$
Total	34,562 $\frac{3}{4}$
<u>AMOUNT FOR LABOR:</u>	
Surface	72,069.57
Underground	191,786.54
Total	263,856.11

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5. LABOR AND WAGES:

b. Comparative Statement of Wages and Product: (Cont.)
6/1/1943 to 12/31/1943

AVERAGE WAGES PER MONTH AS PER LABOR STATEMENT, LESS CAPTAIN AND CLERKS:

Surface	166.07
Underground	<u>182.13</u>
Total	<u>177.63</u>

PROPORTION OF SURFACE TO UNDERGROUND MEN:

1943 - 1 to 2.42 Five 3-8 hour and 2-8 hour shifts 1/1/43 to 6/12/43
 Five 3-8 hour and 1-8 hour shifts 6/12/43 to 7/6/43
 Five 2-8 hour and 1-8 hour shifts 7/6/43 to 12/31/43.

The above proportion is out of line with the other Negaunee District Mines on account of the small number of employees working in the mine and to the extraordinary number of employees on surface account of repairs and improvements.

6. SURFACE:

a. Buildings:

This part of the annual report gives in detail the extensive improvements to the surface plant. Conditions were much worse than was anticipated, consequently the time required for repairs and the cost is entirely out of line with the estimates submitted under E. & A.-- C C 119. This E. & A. will be discussed later in the report under Heading No. 12 "New Construction and Proposed New Construction", and No. 13 "Equipment and Proposed New Equipment".

Office Building:

This building was given early attention as it was in an unsightly condition due to lack of cleaning, paint and varnish. After painting the walls and ceiling, rewiring to code specifications, and new lighting fixtures, the floors were sanded and given three coats of hard varnish. The office furniture was washed and varnished, rubber matting laid in the aisles, and a woman janitor engaged to mop and dust once each week. The warehouse is attached to the office and was full of supplies, all shelves loaded and the floors covered with the overflow. Partitions were moved to enlarge the room, new counters, shelves and bins installed, floor and walls painted, surplus stock removed, and regular stock sorted and arranged on shelves. The warehouse although small is now well arranged for convenience in handling, checking and giving out supplies. The wiring in the warehouse was also changed to bring it to code specifications and new lights were installed.

Dry House:

The old dry house was entirely too small for the employees. The dirty clothes room was packed with mine clothes with the result that the wet clothes did not have a chance to dry between shifts. An addition was planned to be built on the West side of the dry, twelve feet wide by eighty-six feet in length, to provide a first aid room, a check room, a dirty clothes room, shower room and clean clothes room for the surface employees, a wash room for the underground employees,

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6. SURFACE: (CONT.)

a. Buildings: (Cont.)

and a combined change room and office for the surface foreman. The surface men changed in the clean clothes room in the old dry with the result that it was not a clean room in any sense of the word. The former shower room for the surface and underground men was added to the dirty clothes room, the former cap lamp room which had previously been a part of the shift bosses' room was moved to the first aid room in the old dry. The first part of the work was nearly completed by the end of the year except for a few details and early in 1944 the new, rearranged quarters will be in use. In addition to the above brief comments of the many changes made should be added these items, new steam heating lines, new water lines, additional unit heaters, two suction fans for ventilation of the underground men's dirty clothes room, and one suction fan for the new surface men's dirty clothes room. The addition to the dry was made as fireproof as possible with cement floors, and cement plaster on metal lath. The outside walls and ceiling was insulated to conserve heat. The old dry building was rewired throughout to code specifications and additional lights installed. At the end of the year the incompleting work consisted of alterations in Captain's and Shift Bosses' rooms as follows: Rewiring these rooms to code specifications, new steam and water lines, patching cement plaster, new doors, and painting of walls. In the main part of the old dry the work still to be done consisted of rearrangement of the clothes hangers and benches in the dirty clothes room, repair and painting of steel lockers for the clean clothes, benches for the men in the clean clothes room, supports under the steel lockers to raise them eighteen inches off the floor, (they had formerly set on the concrete floor and the bases were rusted away), and painting of all the interior walls of the old dry house. In the addition to the dry the work was nearly completed except for moving in thirty lockers, painting the lockers and transferring the surface crew to their new quarters. The exterior wall of the new addition was not completed as it was impossible to obtain imitation brick sheeting for covering to correspond with the sheeting on the old building. The walls of the new addition were temporarily covered with light weight rubberoid roofing for protection until the imitation brick sheeting is available, probably in the summer of 1944.

It must be borne in mind that all of the work in the old dry had to be done while the dry was in use. The old steam and water lines had to be used until the new lines were installed and ready to be cut in, after which the old lines had to be dismantled and removed. Rearrangement of hangers for dirty clothes and benches for the men will have to be made without interference and friction with the men. This is also true of the rearrangement of lockers in the clean clothes room. The surface men will have to be moved to their new quarters, etc.

The heating boiler in the dry house was in need of repairs, as the base of the firebox was burned out, also the supports for the grates. There was leakage of water in the base of the boiler and the boiler tubes had to be rolled. A diamond drill boiler was borrowed and set up outdoors near the heating boiler to supply steam while the regular boiler was undergoing repairs. The repair job proved to be quite extensive and costly. It was decided to check the capacity of the boiler with the additional load of steam required for heating the new addition to the dry and also the new garage. This check showed that the old boiler would be under forced firing in severe cold weather with a probability that the necessary temperatures could not be maintained. It was decided to obtain a new boiler of larger capacity and to dispose of the repaired boiler. It was later sold to the Holman Cliffs Mine on the Mesabi range. The new boiler arrived late in October and was installed and in commission in November. The automatic stoker had to be overhauled,

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6. SURFACE: (CONT.)

a. Buildings: (Cont.)

the worm feed repaired, and a new coal hopper built. The new boiler was larger than the old one and the smoke outlet was in a different location and it was necessary to tear out the wall enclosing the old coal bin and add this room to the boiler room in order to make space for the automatic stoker. An addition was then built to the boiler room for storing ten tons of stoker coal. This addition has a concrete floor and cement plaster walls on metal lath so that it is practically fireproof.

The waste water from washing the floors of the dry and from the shower bath rooms drains to a small sump near the boiler and is then pumped by an automatic pump into the mine water discharge line. The water from the toilets and urinals drain into a septic tank and the overflow is conducted in tile drains into the timber yard. It was noted that the ground would no longer absorb the overflow water and pools formed on surface. This condition had to be corrected and to accomplish this it is planned to construct a covered sump beyond the septic tank and install two small automatic bilge pumps to pump the water into the mine discharge line about forty feet distant. The pumps were ordered early in November and delivery is promised in February. As soon as men are available the excavation for the tank will be made and the tank and building constructed. After this new unit is in operation it is planned to pipe the waste water from the showers and from washing the dry to the new sump and remove the automatic pump near the boiler.

Coal Dock:

A natural ravine South of the dry house made an ideal location for a coal dock. The new stull timber spotting track built by the Lake Superior and Ishpeming Railway Company ended at the ravine. The ground was first leveled at the site of the dock, after which concrete piers were built to keep the trestle legs off the ground. After a concrete retaining wall was built at the South edge of the ravine, a trestle about sixty feet in length was erected. The stocking area under the trestle will hold sufficient steam coal for the steam shovel loading in the summer and also in an enclosed area comprising two bents will store about seventy tons or three ore cars of stoker coal for the heating plant in the dry house. The consumption of coal for heating will probably average 100 tons per month.

Garage Building:

It was necessary to have a heated garage for the new mine truck and for the Diesel tractor. The concrete foundations for this building, twenty-four by twenty-six feet in size, were erected just West of the old garage which houses the old mine truck and the old Chevrolet automobile. As soon as work in the dry house is completed the new garage will be built. The old garage is steam heated and the steam line will only have to be extended a few feet to reach the new building.

Storage Shed:

The old building housing the iron and pipe was entirely too small and too far gone to warrant repairing and enlarging. Concrete foundations for a new building were installed and the frame erected in the fall. Shortage of carpenters made it advisable to temporarily postpone the completion of this building until other more important buildings had been erected. Work will probably be resumed in February, 1944.

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6. SURFACE: (CONT.)

a. Buildings: (Cont.)

Addition to Engine House for Heating Plant:

The old steam line in underground launder from dry house to shops and the engine house rusted away and numerous leaks developed when steam was turned on in October. A new line was installed to the shops and later this line was extended to the shaft house landing. Instead of digging up and renewing the steam line from the shops to the engine house it was decided to install a small heating boiler at the engine house. A small concrete building was constructed on the Northeast corner of the engine house, large enough for the boiler and storage for a ton of coal. A small boiler was found and after necessary repairs was installed and a stack erected. The motors in the engine house generate sufficient heat to keep the building warm except in the winter months, November to April, in which months the new heating unit will be in commission.

b. Ore and Rock Trestles and Stockpile Grounds:

The stockpile grounds used by the Republic Steel Corporation extended due East from the shaft house. The low point of the grounds was near the shaft with the ground rising to the East. In the spring after heavy rainfall water to a depth of over two feet covered an area nearly 200 feet in length to the East and Southeast of the shaft. An electric pump was used with hose discharge line to remove the water. The capacity of the grounds was also inadequate for the stocking of ore produced during the winter months and the tractor-bulldozer was used to spread the ore pile to make more stocking room available under the trestle. While shipping from pocket, stocking of wet ore was impossible during the time the last portion of the stockpile was loaded by steam shovel until the trestle had been re-erected. Wet ore was therefore loaded in railroad cars during this period which lasted for several weeks. This situation had to be corrected and plans were made for grading the grounds to provide for natural drainage and for enlargement of the stocking area. Room had to be provided for two stocking trestles separated by the pocket railroad track, one curving to the Northeast and the other to the Southeast from the permanent trestle at the shaft until sufficient distance had been gained to separate the two stockpiles from which point both trestles extended due East. An old rockpile made by the former operators extended onto the area necessary for stocking from the Northeast trestle. The Cleveland-Cliffs Iron Company did not have the mechanical equipment available for the job and a contract was given Lindberg Bros., local contractors, to grade, level and spread a layer of rock 10" in thickness on the stockpile grounds. It was assumed that the stockpile made last winter by the Republic Steel Corporation on which wet ore had been dumped by the Cleveland-Cliffs Iron Company after June 1st would all be loaded and shipped in ample time for grading this portion of the stockpile grounds. Unfortunately this was not the case and the grading work could only be approximately 60% completed by the contractors. However the heaviest fill required has been completed and the major portion of the old rock pile removed in this work. The fill was also extended 400 feet to the East of the stockpile grounds for a sub grade for a stockpile loading track to be built later on the North side of the Northeast stockpile. It is planned to complete the grading program in the summer of 1944. It should be added that ledge was encountered in the grading operations at several places and numerous holes had to be drilled and blasted to loosen the rock so that it could be removed with the grading equipment.

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6. SURFACE: (CONT.)

b. Ore and Rock Trestles and Stockpile Grounds: (Cont.)

The curve to the Northeast Stocking ground from the permanent trestle crossed over the pocket track. It was impractical to use timber for this crossing due to the length of the span and accordingly four steel legs set on concrete piers were installed to support the steel members used to carry the wood stringers over the tracks. When this work was completed a portion of the wood trestle was erected as rapidly as possible as loading from pocket had to be stopped sooner than was anticipated due to deferments of shipments by some customers until next season. Stocking was started on November 12th when 9 bents of the wood trestle was erected. The balance of this trestle comprising 15 bents was erected in November and early December. It was soon evident that at the rate this trestle was being filled additional stocking capacity would be needed before shipping started in the spring of 1944. In December the Southeast trestle was staked out on the ground and it will be erected within sixty days. The old stockpile will interfere with the erection of this trestle as one of the legs of the new bents will be on the side of the old pile. Fortunately sufficient legs, caps, and stringers had been purchased to permit of erection of all the trestle required. It is planned to leave room for stocking wet ore on the Northeast stocking grounds next summer while the old stockpile is loaded as also the ore stocked from the new Southeast trestle. It will also be necessary to grade this area before the Southeast trestle can be erected again and stocking resumed here. It is therefore imperative that shipments from stockpile start early in the season and continue until the ore is all removed from this area.

The rock trestle used by the former operators leaves the permanent trestle on a sharp curve and only extends a short distance from the shaft. All the rock stocked has to be moved by the tractor-bulldozer some distance to the West into an old cave to surface. This cave is rapidly being filled and as soon as conditions permit the old rock trestle will be dismantled and a new trestle built on an easy curve across the pocket tail track and then extended nearly due West to the unfilled portion of the old cave. The balance of the cave will then be filled by scraping the rock away from the trestle with the bulldozer but the scraping distance will be 200 feet shorter.

c. Timber Yard:

When the change in management took place on June 1st, the situation in the timber yard was given early attention. Timber purchases by the former operators had been heavy in the winter of 1942-1943 in anticipation of strikes by the lumber jacks who were organized in 1942. The seven and eight foot stull timber had been delivered in most part by trucks and the timber spread over several acres of ground. Very little of it was of standard size, that is nine to twelve inch diameter, most being seven and eight inches in diameter. It was not large enough to use in top slicing and also was not standard length, namely nine feet. Delivery of standard size timber in nine foot lengths was immediately started by trucks. The timber yard however was so filled with old seven and eight foot timber that it was evident something had to be done to clean it up and start orderly piling of incoming mine timber. Accordingly a tentative location for a timber track was submitted to Mr. Day, Chief Engineer of the Lake Superior and Ishpeming Railway who sent an engineer to make a preliminary survey and profile. After taking up the matter with the Duluth, South Shore and Atlantic Railway Company it was learned that they considered the income from freights would not warrant the

CAMBRIA-JACKSON MINE
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6. SURFACE: (CONT.)

c. Timber Yard: (Cont.)

the building of the track. After some delay the track was built by the Lake Superior and Ishpeming Railway Company. Grading of the timber yard was started prior to installation of the track and completed when the track was laid. Since this time most of the timber has come to the mine on railroad cars and has been unloaded onto skidways. There is an easy grade down hill from the timber track to level ground in the timber yard which permits of timber piles about 12 to 16 feet in height. A track for lagging and poles was also installed by the Lake Superior and Ishpeming Railway Company. The sub grade for this track as also the stull timber track was made by the mine tractor with bulldozer attachment.

To get rid of the old timber left by the former operators the portable mill owned by the Negaunee District mines was moved from the Negaunee Mine to the Cambria-Jackson, set up and utilized for sawing all the timber in the yard that could not be used in the mine. All tamarack was sawed into mine ties and one inch lumber, also that portion of the hemlock logs that were straight and not full of knots. A portion of the hardwood logs were made into mine ties and one and two inch slabs. The slabs are used in covering down the floors of the sub-levels and also as side lagging. Considerable timber was also brought to the mine from other Company mines to be sawed into mine ties. Old White and Norway pine trestle legs and legs too small to use were cut into sixteen foot lengths and sawed into two by four inch and two by six inch dimension lumber which was used in the construction of new buildings at the mine. The mill was at the Cambria-Jackson Mine for nearly four months before it was dismantled and returned to the Negaunee Mine. Some grading and rocking of roads in the timber yard must be done next spring to complete the work and also ballasting of the lagging track. The yard will then compare favorably with other timber yards of the Company.

d. Shaft House:

The steel shaft house had not been enclosed by the former operators and consequently great difficulty was experienced in stocking ore in the winter season as the ore froze in the dump and in the larry stocking car. Large amounts of salt water was used to thaw the frozen ore. The salt water caused rapid rusting of the steel members and they were in bad condition on the landing and below where they came in contact with the salt water. Due to sag noticed in the floor on the landing under the tracks when the skip dumped into the larry car the planks were removed and the steel members beneath found to be almost entirely eaten away by rust. Temporary repairs were made over the week-end.

Due to the Company steel workers being busy on a job at the Spies-Virgil Mine at Iron River, the work of enclosing the shaft house was delayed until late in November. This work was completed above the landing floor by the end of December. The shaft will now be enclosed from surface to the landing with steel plates. The loading pockets in the shaft house will have to be dismantled in order to repair the steel members. The condition of the pockets were so bad that the former operators put in a number of 12 x 12 square timber legs for supports, but for some unknown ^{reason} did not attempt permanent repairs. It seems probable that the steel legs supporting the pocket and all other steel members in the pocket structure will have to be replaced. It will probably require nearly three months to complete this work with the four steel workers as the old pocket must be torn out, new steel members fabricated and installed, chutes made, the shaft enclosed to the landing, steel doors made for the landing and in the front of the shaft enclosure, etc.

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6. SURFACE: (CONT.)

d. Shaft House: (Cont.)

It is hoped to complete the work prior to the opening of the shipping season. The shaft is upcast and the warm air rising into the enclosed headframe has thus far prevented freezing and it is assumed will entirely eliminate it except in the most frigid weather.

e. Railroad Tracks:

The Duluth, South Shore and Atlantic Railway maintain the mine tracks which are jointly owned by this railroad and the Chicago and Northwestern Railway Company. The latter railroad does the switching and delivers loaded cars to the Lake Superior and Ishpeming Railway Company at the Ishpeming yards. Delays occur when loading from stockpile every time the switch engine leaves with a train of ten loaded ore cars which is the maximum number the Chicago and Northwestern Railway Company engines can push from the mine yard to the main line tracks. The Duluth, South Shore and Atlantic Railway Company gets very little revenue from the mine and only has one section crew to care for the main line tracks and the mine tracks. As a consequence it is difficult to get the section crew when the steam shovel tracks have to be moved and delays in loading often occur. The general condition of the mine tracks is deplorable as the ties are rotten, and the rails worn and bent. The most feasible solution would be for the Lake Superior and Ishpeming Railway Company to purchase the interest of one or both of the railroads in these tracks. A switch track from the Lake Superior and Ishpeming Railway Company track to the Mather Mine can be installed to connect with the Cambria-Jackson mine tracks and the long haul of ore cars to and from Ishpeming eliminated. Maintenance of mine tracks under Lake Superior and Ishpeming Railway Company management would no longer be a problem as is the case under the present set-up.

The pocket loading track was in very bad condition when the mine management changed on June 1st. It was necessary to move empty ore cars over a portion of the tail track above the pocket with the tractor as the ground had settled below grade for some distance across a rock fill in a caved area. After inspection of this track with the Duluth, South Shore and Atlantic Railway Company officials, they agreed to send the section crew to the mine and with the assistance of the mine tractor to put it in condition for use. It was removed and rock moved by the tractor to bring it to a 1% grade. The sub grade was also widened to provide a better base for the track across the fill in the caved area. In re-laying the track it was necessary to replace nearly all of the rotted ties with new ties. The track was also lined up and for the balance of the year no trouble was experienced in dropping the cars down to the pocket. The track at the pocket was lowered and considerable work done below the pocket in a section that was below grade. The old stockpile had spread out so much due to dumping wet ore that the pocket track had been swung to the North on a sharp curve. This curve was eliminated late in the year after a cut had been loaded on the North side of this pile by the steam shovel, but it was too late in the year to ballast the track due to the frozen ground. This work will be done in the spring as soon as the frost is out of the ground, in the meantime the track has been blocked up so that it can be used.

The Duluth, South Shore and Atlantic Railway Company refused to install switch tracks to a new timber and lagging yard and after considerable negotiations permission was granted the Lake Superior and Ishpeming Railway Company to install these two tracks. The switch track for

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6. SURFACE: (CONT.)

e. Railroad Tracks: (Cont.)

spotting cars loaded with mine timber was completed in 1943, the switch for lagging was partially installed but not ballasted. The balance of work on this track will be done early in summer of 1944. The uncompleted track work required at the mine as far as can be seen at this time is as follows:

New rail and ties required for 90% of the mine tracks. Relocation of a portion of the main track to the mine, and 1,000 feet of track to reach the Northeast stockpile grounds. There is also the possibility of trouble developing on the track used for switching empty ore cars above the pocket. This track crossed ground that may settle due to caves nearby and eventual relocation may become necessary.

f. Fences:

There are no fences enclosing the mine property which is immediately South of U. S. Highway #41, except to the West of the mine entrance road. At some time in the future a fence paralleling U. S. Highway #41 should be erected to prevent the public from trespassing on the mine property. In August a number of signs identifying the property as a defense area were erected in conspicuous places and at various points used by employees as shortcuts to the mine.

g. Roads:

The entrance road to the mine is poorly located for cars entering from the West and the grades are bad. It is planned to dismantle the old engine house located near U. S. Highway #41 and build a short section of road direct to the highway. This will eliminate a bad curve and shorten the entrance road about 100 feet. Some surfacing of roads with mine rock was done in 1943 to bring them to grade and eliminate mud holes. More attention will be given to the roads within the mine property in 1944, for in dry weather they are very dusty and in wet weather sloppy with red mud.

h. Water Supply:

Under the Republic Steel Management, drinking water, water for cooling the compressor and for the heating plant and hot water tanks in the dry building was obtained from a sump in the Hartford No. 1 Shaft 325 feet below surface. An automatic electric pump pumped water from this sump to a tank on a hill South of the mine office from which point water lines carried it to the various mine buildings. Samples of water were sent at regular intervals to the State Laboratory at Houghton, Michigan for analysis. Water from this source was used under the Cleveland-Cliffs Iron Company management until a sample sent in August was reported unsafe for drinking. The city water lines extended to the mine and were arranged for instant use by merely opening a valve. This arrangement had been made for fire protection. The city water was turned on and has been in use since August. There was no meter on the city line and up to the end of the year only a nominal charge was made for the water used at the mine. The city has promised to install a meter early in 1944. The former arrangement was not satisfactory from the standpoint of safety as the source of the water was such that contamination was possible after heavy rainfalls. The wood storage tank on the hill South of the office had rotted in the bottom and it was impossible to caulk the leaks. The water that leaked entered the mine by way of a

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6. SURFACE: (CONT.)

h. Water Supply: (Cont.)

nearby cave to surface. It was therefore considered good policy to use city water at the mine and pump the water from No. 1 Shaft into the mine discharge line. To conserve water it will probably be necessary to build a cooling pond near the engine house and use the cooling water from the compressor over and over again, merely adding sufficient city water to make up for the loss from evaporation.

i. Grounds:

There has been a marked improvement in the appearance of the surface plant and grounds since June 1st. There is however room for further improvements, a portion of which will be made in 1944. As now planned this will consist of removal of the old engine house which aside from being unsightly can no longer be used as a storage building due to the roof being almost entirely gone and the floor rotted and buckled. It would not pay to put a new roof on this large building merely to make it usable as a storage shed. One improvement will be the relocation of the entrance road to the mine after removal of the old engine house and later surfacing of this road with trap rock and tar binder to prevent washing out on the hill and also to eliminate iron ore dust and mud. The balance of filling required to bring the stockpile grounds to grade will eliminate most of the unsightly old rock pile in front of the mine office. Grading must be done around office and dry buildings to eliminate mud holes and to permit of a limited amount of grass lawn and shrubbery plantation. Also some shrubbery and coniferous trees should be planted near the engine house and in the area extending from the engine house to the highway adjacent to the new road. The main road now passes near the shaft to the South toward the office, then turns East a short distance, then again to the South between the office and the dry building. In dry weather the iron ore dust blows into the office and the dry and it is impossible to eliminate either the dust or the mud after rains. It is planned to grade this area, build a walk adjacent to the dry and plant grass here. The road will be moved to pass to the West in front of the office and then to the South on the West side of the office. A 24 foot section of an old storage shed will be moved to the West and attached to the West end of the storage shed to make ample room for a roadway at the East end of the storage shed. It might be well to explain that the garages, oilhouse, entrance to warehouse for unloading supplies, road to a section of the timber yard and an outdoor storage yard are all located South of the mine office building and a road to this area is a necessity.

The concrete smoke stack is still standing as the last evidence of the old steam plant built years ago by the Oliver Iron Mining Company when they operated this mine. Due to scaling of the concrete walls near the top of the stack it has become dangerous to persons passing by on the entrance road to the mine. It is planned to blast it down in 1944 with the aid of an expert blaster who will be furnished by the Hercules Powder Company. The stack must fall to the Southwest to clear the mine engine house, the entrance road, and U. S. Highway #41. Good housekeeping and neat appearance of the surface plants at all of the mines has been the fixed policy of the Cleveland-Cliffs Iron Company and given a reasonable amount of time this condition will be a reality at the Cambria-Jackson Mine.

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6. SURFACE: (CONT.)

j. Drainage Ditches, Caves, Etc.:

Comment was made elsewhere in this report of drainage ditches to divert water at the time of the spring thaw and after heavy rainfall from the mine caves adjacent to the old Lilly and Cambria Shafts in the West portion of the Cambria Lease. This water reaches the Cambria-Jackson Mine as the underground working of these old abandoned mines connect to the upper levels of the present mine. For short periods the mine water is two to three times the normal and difficulty is experienced in keeping it under control in the mine. Years ago some ditches were dug by hand to keep the water away from the caves but due to the extension of the caves investigation showed that in many instances the ditches carried the water directly to the caves. After careful study it was decided to dig one main ditch and a number of lateral ditches to divert the water away from the caves. A small revolving steam shovel on caterpillar treads was borrowed from the Cleveland-Cliffs Iron Company idle equipment and used for this work. Some cuts were 8 to 10 feet in depth in order to maintain the proper grades. Lateral ditches were extended past the caves and also into swampy ground areas where water formerly stood for weeks and slowly drained into the caves. At one point it was necessary to install a 16 inch riveted galvanized pipe line 60 feet in length to carry the water past two caves to surface. The ditch ends near U. S. Highway #41 where culverts under the highway discharge into Teal Lake. An effort was made to have larger culverts installed under the highway but due to cold weather nothing has as yet been done and in case of heavy rains it is probable that water will flow across the highway. The success of the drainage ditch program will be determined in the spring of 1944. There are a large number of caves that have broken through to surface in an area extending from the mine Westward to the limit of the old workings at the Lillie Mine. Some of these caves are quite extensive in an East-West direction along the strike of the formation. Several do not connect with the present mine workings and are full of water. In one of these large caves the former operators had installed a four inch pipe siphon line that carried the water across the mine property and discharged it near Teal Lake. In the spring of the year after the break-up, the siphon would lower the water about ten feet in this cave. This siphon line was repaired and put into use in June, 1943, and the water lowered. In one of the old Lillie Shafts near the West limit of the Cambria Lease water flowed out at surface in June and July prior to the drainage ditch which was dug in October. This water saturated a swampy area and eventually reached a cave that connected with the mine. One of the caves to surface was less than 200 feet from the present operating shaft and within 100 feet of the old Hartford No. 1 Shaft. Since taking over the mine in June this cave has been filled with rock and as settlement occurs it is brought back to grade by scraping in more rock. It is expected that the fill will soon be compacted and further settlement eliminated.

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7. UNDERGROUND:

a. Shaft Sinking:

There was no shaft sinking in 1943 and none is contemplated in the immediate future.

b. Development:

The following table gives the total footage of drifting and raising for the seven months period of operation by the Cleveland-Cliffs Iron Company:

<u>Ore</u>	<u>Drifting</u>		<u>Ore</u>	<u>Raising</u>		<u>Grand Total</u>
	<u>Rock</u>	<u>Total</u>		<u>Rock</u>	<u>Total</u>	
766'	535'	1301'	860'	473'	1333'	2634'

The areas being developed are the South riser of the Main Deposit above the Sixth Level and the Southwest riser of the Main Deposit above the Seventh Level.

The South riser of ore which started from the Main Deposit at a point below the Sixth Level extended about 375 feet above the Sixth Level. The upper 150 feet of this deposit had been mined prior to the time The Cleveland-Cliffs Iron Company assumed the management of the mine. This territory is very badly cut up with dikes, there being two 10 foot Easterly-Westerly dikes and another large one cutting through in a Northeasterly-Southwesterly direction. The two Easterly-Westerly dikes each in turn split into two in their upward extension. This condition makes it difficult to mine without contamination from the dikes. The plan of development followed by the former operators was very poorly planned and not at all suited for top slicing and therefore new plans for development were adopted. These plans are being followed and the work will be completed in another two or three months.

The Southwest riser is being developed from the Seventh Level. The only development in this territory prior to the Company taking over the mine was one raise from which a transfer drift was driven due West through the center of the ore body. This transfer drift is about 125 feet above the Seventh Level and from this drift mills were put up to an elevation 40 feet above where mining by sub-level caving was started. With this layout the ore is transferred three times before it gets into the haulage cars, being scraped into the mills by the miners, from the mills it goes to the transfer sub, from which it is scraped into the main raise. From the main raise it is discharged into a loading sub which is 20 feet above the level from which point it is then scraped into another raise which empties into the haulage cars. It is planned to complete the mining of this sub by the sub-level caving system and by the time the ore is removed all development work necessary for top-slicing will be finished. The sub-level caving system worked very well on the first sub as the hanging is very irregular and this system permits of mining to the hanging where such irregularities occur.

Other development consisted of 589 feet of drifting and 558 feet of raising, all on the 25' Sub and 70' Sub and above. All of this footage, with the exception of 181 feet of drifting and 20 feet of raising, was done to facilitate the mining of the ore that was taken out by the sub-level caving system. Practically all the mining places that were continued on this system after The Cleveland-Cliffs Iron Company took over were the top Subs underneath the hanging. In many places the ore

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7. UNDERGROUND: (CONT.)

b. Development: (Cont.)

would extend 40 to 50 feet above the slicing drift which necessitated putting up small raises to the hanging from which small dog drifts were driven directly over the slicing drifts at 15 to 20 foot intervals in elevation, the number of intervals depending on the height of the ore. In this manner it was possible to reach and mine the ore in the high areas in the irregular hanging.

The above-mentioned 181 feet of drifting and 20 feet of raising was on the 70 foot sub to provide a ventilation and travelling road.

b-1. Rock Development:

The following table gives the total footage of rock drifting and raising for the seven months period of operation by The Cleveland-Cliffs Iron Company:

	<u>Drifting</u>	<u>Raising</u>	<u>Total</u>
6th Level	16'	138'	148'
7th Level	460'	188'	648'
Total	<u>470'</u>	<u>326'</u>	<u>796'</u>

The 10 feet of rock drifting on the Sixth Level as shown in the above table represents the crossing of a 10 foot dike in an ore drift in the South riser of the Main Deposit.

The 138 feet of rock raise shown in the above table was encountered in extending No. 100-A raise from the Sixth Level to a height of 218 feet. This was a part of the plan for developing the South riser of the Main Deposit.

Plans for the development of the Southwest Deposit consisted of driving 315 feet of drift along the footwall contact on the Seventh level from which two raises were to be put up to the North and three to the South. The two to the North were to be put up to an elevation of 49.5 which will be the elevation of the first sub in this territory to be mined by the top-slicing method. It was planned to extend the three to the South up to the top of the ore body. To date the drifting on the Seventh Level and the two raises to the North and one of the three to the South have been completed. The raises to the North are called No. 731, No. 733; and the ones to the South No. 730, No. 732, and No. 734. No. 731 entered the ore 40 feet above the level and No. 733, 67 feet above. It was expected that raise No. 730 which entered the ore 43 feet above the level would be in ore to an elevation of about 20 feet above the Sixth Level as Diamond Drill Hole No. 133 drilled South at a plus 5% angle from the Southwest end of the Main Deposit on the Sixth Level showed ore in the location where this raise was put up. The records of this hole must have been incorrect as the raise left the ore at an elevation of about 72. From this point the raise was continued full size for 58 feet in very lean ore and jasper, and from there an additional 30 feet of small test raise was put up with no change in material. The elevation of the back of this test raise was about 160 whereas the elevation of ore shown in Diamond Drill Hole, allowing for plus angle of the hole, should have been about 135. This raise was actually extended 37 feet above the Sixth

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7. UNDERGROUND: (CONT.)

b-1. Rock Development: (Cont.)

Sixth Level to make certain that no ore was over looked in this area.

b-2. Ore Development:

The following table gives the total footage of ore drifting and raising for the seven months period of operation by The Cleveland-Cliffs Iron Company:

	<u>Drifting</u>	<u>Raising</u>	<u>Total</u>
6th Level	172'	133'	305'
7th Level	None	316'	316'
Total	172'	449'	621'

The development on the Sixth Level was confined to the South riser of the Main Deposit and consisted of following the plan adopted at the time the Company took over this property. This plan called for a drift to the South across the ore body from which two raises were to be extended directly to the top working sub, one to be South of the South dike and the other North of the South dike and a third raise to be put up from the old haulage drift to the North side of the North dike. This will eliminate the transfer of ore, timber and supplies and will also eliminate the crossing of dikes in slicing operations. The drift and one of these raises has been completed and the other which are now being started will be completed within a couple of months.

c. Stoping:

(1) General:

On June 1st when The Cleveland-Cliffs Iron Company took over the operation of the mine all mining was being done by the sub-level caving system. The change from this system to top slicing, which has been adopted for this property, had to be made gradually as many of the working places already developed and in process of being mined had to be completed. By the end of June, five of the thirteen mining contracts had started mining by the top slicing system. At the end of the year there were ten gangs top slicing and three still working on the old system. The number of mining contracts has not as yet been increased but it is probable that three new working places will be started within a few months if miners are available.

After a thorough examination of the maps and sections an area was found that was being mined which possibly cave or draw the South riser ore body which, 255 feet above, partially overlaps this area. At the time this mining was started by the former operators the limits of the ore in the South riser were not known. The sub being mined was completed to a set limit and then temporarily abandoned. This condition necessitates leaving a pillar 250 feet in an East-West direction extending North-South through the ore body until such time as the South riser is mined down to an elevation where the North limit of the ore body extends farther to the South. This will take some time as possibly four or five subs will have to be mined before operations in this pillar can be resumed.

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7. UNDERGROUND: (CONT.)

c. Stoping: (Cont.)

(1) General: (Cont.)

<u>Location of Contracts</u>	<u>June 1, 1943</u>	<u>December 31, 1943</u>
<u>Sixth Level and Above</u>		
350' Sub-Level	2	
325' Sub-Level	1	3
Sixth Level		2
<u>Seventh Level and Above</u>		
90' Sub-Level	2	
70' Sub-Level	7	7
50' Sub-Level		4
Seventh Level		2
Total	12	18
Increase		5

Occupation of Contracts were divided as follows;

	<u>June 1, 1943</u>	<u>December 31, 1943</u>
Mining	12 Contracts	13 Contracts
Raising	None	3 Contracts
Drifting	None	2 Contracts
Total	12 Contracts	18 Contracts

The above table shows a gain of six contracts, one mining and five developing.

The following table gives the working schedule as of June 1st when The Cleveland-Cliffs Iron Company took over operations and as of December 31st, 1943.

	<u>June 1, 1943</u>		<u>December 31, 1943</u>	
	<u>No. of Contracts</u>	<u>No. of Miners</u>	<u>No. of Contracts</u>	<u>No. of Miners</u>
<u>Weekly Schedule</u>				
	5--3-8 hour shifts		5--2-8 hour shifts	
	2--2-8 hour shifts		1--1-8 hour shifts	
Total	17--1-8 hour shifts		11--1-8 hour shifts	

On June 12th the schedule was changed to 5---3-8 hour shifts and 1--1-8 hour shifts to bring this mine in line with the other mines operated by The Cleveland-Cliffs Iron Company and secondly to allow more time to take down timber and supplies. The present schedule of 5--2-8 hour and 1--1-8 hour shifts was started on July 6th. This change of schedule was necessitated by the fact that it was found impossible to keep up production and at the same time take down the increased amount of timber and supplies required for the change from sub-level caving to the top slicing system. In July, eight of the thirteen Contracts were top slicing.

The following table gives a comparison of the number of men in all classifications of labor, employed underground in June and December.

	<u>Contract Miners</u>	<u>All other Men</u>	<u>Total</u>
June	80	95	175
December	60	95	155
Decrease			20

The reason for the loss of twenty miners, as shown in the above table was due to the change in schedule on July 6th. At the time of the change all men were retained with the exception of two men who were transferred to the Mather Mine. The extra miners were employed on other jobs such as timbering, hoisting and distributing timber, and other underground labor. The loss in total number of men was due to men leaving to take

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7. UNDERGROUND: (CONT.)

c. Stoping: (Cont.)

(1) General: (Cont.)

other jobs and to a few inducted and volunteering in the armed services.

During the seven months operation by The Cleveland-Cliffs Iron Company ore was mined on the 350' and the 325' Sub above the Sixth Level and the 90' Sub, 70' Sub and 50' Sub above the Seventh Level.

(2) Detail of Stoping:

350' Sub - South riser ore body:

When the Company started to operate the mine this sub was nearing completion with two gangs working. At this elevation it was found that the ore extended much further to the North than on the subs above and because of this extension it was necessary to stop mining the ore that was underneath and North of this area at the elevation of the 70' Sub, 320 feet below. The mining on this sub was continued on the sub-level caving system and was completed in July.

325 Sub - South riser ore body:

Mining was started on this sub just a week or so before the change in management. At the end of the year there were three gangs working here, all mining on the top slicing system. The interval between this sub and the one above is 25 feet which leaves 14 feet of solid ore above the slices, practically all of which is blasted down and recovered after covering the floor of each slice with two layers of poles and wire netting. The reason for the 25 foot interval which is much more than normal was because the sub had been developed by the former operators and it was necessary also to have some ground over the slices to hold back the accumulation of rock on the subs above, the floors of which had never been covered. Due to the fact that this sub is 225 feet above the level and all supplies must be hoisted up through a staggered raise and again transferred through a drift and mill to the working place and also that the greater part of the ore must be transferred before it reaches the Sixth Level, the progress has been very slow. Another factor is that this territory is crossed by numerous dikes which makes it necessary to cross-haul from behind the larger ones. It is expected that the new development which is nearing completion will eliminate most of the operating difficulties.

90' Sub - Main Deposit:

On June 1st two gangs were mining by the sub-level caving system and work was completed in July. It was at this elevation, which is approximately 20 feet below the Sixth Level, that a small riser of ore connected with the Main Deposit.

70' Sub - Main Deposit and Southwest riser:

At the time the Company took over the operation of the mine there were seven gangs mining here and at the end of the year the same number were employed. This sub consists of three separated areas, the West end, Main Deposit, and the Southwest riser. The ore in the West end was a riser which extended 45 feet above the Sixth Level and probably connects with the Main Deposit at the elevation of the 90' Sub which is approximately 20 feet below the Sixth Level. A Western mining limit had to be set in this area to protect the main haulage drift to the South riser on the Sixth Level and a pillar to support the upper portion of the South riser ore. The mining of this area by the sub-level caving method was completed in July.

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7. UNDERGROUND: (CONT.)

c. Stoping: (Cont.)

(2) Detail of Stoping: (Cont.)

70' Sub - Main Deposit and Southwest Riser:

The Main Deposit or center area was being mined by three gangs by the sub-level caving method when the Company took over operations, one in the West end and two in the East end. The two slices in the East end that were already developed for sub-level caving were completed to a point where there is no possibility of a cave or pull occurring. At the present time there are four gangs top slicing in the Main Deposit and the sub is about 70% mined.

The Southwest Deposit is a riser of ore which in spots extended as high as the Sixth Level due to the hanging being very irregular. The 70' Sub is the first sub in this area and will be completed by the sub-level caving method as this system lends itself very well to mining under an irregular hanging although this has to be supplemented in the high spots by small raises and lateral drifts to reach the top. By the time this sub is mined the developments necessary for top slicing will have been finished and this entire area will then be mined by this method. At the end of the year three gangs were working here.

50' Sub - East end of Main Deposit and Southwest Riser:

There was no mining done at this elevation by the former operators. There are two gangs top slicing in the East end of the Main Deposit and their product is being transferred on the 25' Sub to No. 100 raise. This transfer will continue until the new raises are completed from the Seventh Level.

Raises No. 731 and No. 733 in the Southwest ore body have been completed to the elevation of the 50' Sub and one gang is now cutting out and timbering over No. 731 raise preparatory to driving a drift to connect these two raises.

d. Timbering:

The former operators had done considerable developing for sub-level caving consisting of a large footage of transfer drifts and mill raises. The timber used in this development was very small and has been installed for some time and is now rotting and breaking requiring considerable retimbering. This is also true of the main level timbering and especially of a section of the Sixth Level drift in which the ventilation fan is installed. This Sixth Level drift connects with the old workings through which fresh air is drawn by the fan through a cave to surface. Part of the repair work here is due to rotting of the small timber used by the former operators but in one section in the transition slates there is fairly heavy pressure due largely to the slabbing of large pieces of rock. The long raises in which four by six inch square hardwood cribbing was installed by the former operators have proven very difficult to maintain. The cribbing are cut by the falling ore and often a section 20 to 40 feet in length will loosen and come out into the raise. There have been a number of serious delays to production from this cause, especially so in December when transfer raises serving several contracts were out of commission for nearly a week while undergoing repairs. Regular round tamarack and hardwood cribbing six to eight inches in diameter is being

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7. UNDERGROUND: (CONT.)

d. Timbering; (Cont.)

used in the new raises as it lasts much longer than the small four by six inch sawed hardwood cribbing. All the old raises have been repaired and lined with two & three inch hardwood plank, the new raises are lined with plank after they have been in use for a few weeks.

Statement of Timber Used:

	<u>Lineal Feet</u>	<u>Avg. Price Per Foot</u>	<u>Amount</u>
Framed Cribbing	10,240	.0722	739.20
8" Stulls	9,846	.0908	893.83
10" Stulls	23,770	.1214	2,884.98
12" Stulls	6,767	.1748	1,182.66
14 " Stulls (& over)	<u>2,237</u>	<u>.1829</u>	<u>409.16</u>
Total	52,860	.1156	6,109.83
Lagging--7'	333,831	.0099	3,291.83
Poles----9½'	<u>254,107</u>	<u>.0170</u>	<u>4,328.34</u>
Total	587,938	.0130	7,620.17
Wire Fencing---Feet	<u>7,425</u>	<u>.0655</u>	<u>469.80</u>
Grand Total			14,199.80
Product			147,700
Feet of Timber per ton of ore			.358
Feet of Lagging per ton of ore			2.260
Feet of Lagging per foot of timber			6.315
Feet of Wire Fencing per ton of ore			.050
Cost per ton for Timber			.0414
Cost per ton for Lagging			.0223
Cost per ton for Wire Fencing			.0032
Cost per ton for Poles			<u>.0293</u>
Total Cost Per Ton			<u>.0962</u>
Equivalent of stull timber to board measure:			113,242
Feet of board measure per ton of ore:			.767

It is impossible to obtain a true picture of timbering cost from the above statement. The consumption of timber in mining by the sub-level caving system is only a fraction of the amount required in the top slicing system. In the seven months the mine was operated by the Cleveland-Cliffs Iron Company, mining was divided approximately evenly between the two systems. As a partial offset to the smaller amount used by the sub-level caving system was the increased use of poles and wire fencing for covering the floors of the sub-levels in the areas where the top slicing system was started. The only way to form an idea of the probable cost for the timber that will be used in this mine when mining is entirely by the top slicing system is to compare the cost in seven months of 1943 with the cost at several of the operating mines in the Negaunee District.

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7. UNDERGROUND: (CONT.)

d. Timbering: (Cont.)

Cost Statement of Timber, Lagging Poles and Wire Fencing:

<u>Production</u>	<u>Cambria-Jackson</u> <u>147,700 tons</u>	<u>Negaunee</u> <u>954,400 tons</u>	<u>Athens</u> <u>517,814 tons</u>
Timber	.0414	.0671	.0804
Lagging	.0223	.0380	.0319
Poles	.0293	.0405	.0462
Wire Fencing	.0032	.0002	.0004
Total	<u>.0962</u>	<u>.1458</u>	<u>.1589</u>

The above statement shows the cost at the Cambria-Jackson Mine to be less than at the other two mines as was to be expected due to mining nearly 50% of the ore in the seven months' operation by the sub-level caving system. The full effect of the change in mining system in its relation to cost of timber will not be realized until late in 1944. The first sub-level has to be mined by the top slicing system under almost the same conditions as when mining by the sub-level caving system; as ore from 10 to 14 feet in thickness is left in the back and after the floors of the sub-level are covered with a layer of poles, wire fencing and a second layer of poles, the back is blasted down. This has to be done for two reasons---first, to utilize the development already completed by the former operators and secondly to leave an ore support above the slices to prevent runs of rock from the uncovered mined area above.

Consideration must also be given to the product from the mines as this has an effect on cost. Maintenance cost per ton is less in large producing mines for repairs to drifts and raises, while the cost in actual mining operations is controlled largely by pressure which determines the size of the timber. Pressures in the Cambria-Jackson Mine are not heavy as is the case at the Athens Mine and in some areas at the Negaunee Mine so that smaller timber can be used until such a time as caving to surface occurs above the ore body on the Jackson Strip or at least until pressure developed by caved material over the mined areas becomes sufficient to cause breaking of the timber sets.

Cost for timber at the Cambria-Jackson Mine late in 1944 will increase to probably fifteen cents a ton and may exceed this figure unless the cost per foot for timber, lagging, and poles is reduced.

e. Drifting and Raising:

The following table gives the total feet of drifting and raising in ore and rock for from June 1st, to December 31st, 1943:

<u>Drifting</u>			<u>Raising</u>			<u>Grand Total</u>
<u>Ore</u>	<u>Rock</u>	<u>Total</u>	<u>Ore</u>	<u>Rock</u>	<u>Total</u>	
766'	535'	1301'	860'	473'	1333'	2634'

A heavy development program was started in June and is not yet completed. It is planned to provide individual raises for each mining contract which will eliminate the many transfers now in use, and also permit control of the water which under the former operators was a serious handicap. The development program also includes a drift on the

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7. UNDERGROUND: (CONT.)

e. Drifting and Raising: (Cont.)

Seventh Level about 1800 feet in length to the West line of the Jackson Strip where it will connect with a drift from the Mather Mine. This connection will provide ventilation and a second outlet for both mines, and will be of value in exploring the West 1320 feet of the Jackson Strip beyond the fault which cut off the ore on the Sixth Level. There is also a considerable amount of drifting to be done on the Sixth Level to by-pass an ore pillar where mining has been stopped to protect the present Sixth Level haulage drift. These drifts together with a number of raises will make it necessary to continue the heavy development program during most of the coming year.

The old drifts in the mine are timbered with 7' and 8' timber, 8" to 9" in diameter. This allows very little room in the drifts for storage of timber, lagging and poles, and for ditches for water drainage. The new drifts are made larger and 8' and 9' timber, 10" to 12" in diameter is used wherever timbering is necessary. The raises put up by the Republic Steel Corporation were of two sizes, the three long raises above the Sixth Level being standard size, five feet, four inches overall, with all other raises only four feet over all. The Standard Cleveland-Cliffs Iron Company raise uses five foot, four inch cribbing.

f. Explosives, Drilling and Blasting:

The cost per ton for all explosives was surprisingly low in comparison with the other mines in the Negaunee District. The ore is rubbery in character, not as soft as the Athens Mine ore, and more like the Negaunee Mine and Maas Mine ore. It is apparent that the system of mining effects the consumption of powder to a considerable extent as the cost for seven months' operation was \$.018 per ton lower than the cost at the Negaunee Mine and \$.005 less than at the Athens. The cost per ton for explosives will doubtless increase when all the ore is mined by the regular top slicing system.

When the transfer was made and an inventory of the drill machines completed it was found that many were old models no longer manufactured, and others were so badly worn as to no longer warrant repairs. Twelve new Ingersoll Rand, R. B. 12, Auger Drill Machines were ordered and also several drill machines for raising. Fortunately there were a small number of modern machines, purchased since 1940 that were in good condition. Many of the old drill machines have been scrapped and doubtless others not yet examined will be removed later from the inventory as worthless. There was a large amount of one inch octogan hollow drill steel on hand at the mine but other sizes were scarce. The one inch hollow steel is used in shaft sinking and in raising in very hard ground. A few bars were kept for emergency use, and the balance transferred to the General Storehouse at Ishpeming for sale to other Company mines.

The regular inspections of blasting practice in the contracts was started by the shift bosses as soon as possible after the transfer. Fuse is capped in an underground fuse house and powder distributed from powder houses on the Sixth and Seventh Levels. Gelamite No. 1 is used for blasting at this mine and at all the other mines of the Company.

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7. UNDERGROUND: (CONT.)f. Explosives, Drilling and Blasting; (Cont.)

Year	Cost per Lb. For Powder	Lbs. Powder per Ton of Ore	Cost per Ton Powder	Cost per Ton Fuse & Caps	Total Cost
1943	.115	.3551	.0408	.0098	.0506

Statement of Explosives Used: (Ore Development and Stopping)

	Quantity	Average Price	Amount 1943
Gelamite #1 - lbs.	22,990	11.499	2643.83
Gelamite #2 -	25,961	11.50	2985.55
60% Gelatin	3,500	11.50	402.50
Total Powder	52,451	11.50	6031.88
Fuse---feet	171,170	5.471	986.70
Caps---#6	26,978	12.20	329.13
Tamping Bags	10,000	4.967	49.67
Fuse Lighters - Hot Wire	7,500	8.10	60.75
Fuse Lighters - Master	1,000	20.64	20.64
Electric Detonators	0	0	0
Connecting Wire - lbs.	1		.55
Total All Explosives			1447.44
			7479.32

Product	147,700
Pounds of powder per ton of ore	.3551
Cost per ton for powder	.0408
Cost per ton for fuse, caps, etc.	.0098
Cost per ton for all explosives	.0506

Statement of Explosives Used: (Sinking, Rock Development, etc.)

	Quantity	Average Price	Amount 1943
Gelamite #1 - lbs.	250	11.50	28.75
Gelamite #2 -	50	11.50	5.75
60% Gelatin	100	11.50	11.50
Total Powder	400	11.50	46.00
Fuse - feet	2704	5.25	14.18
Caps - #6	204	12.20	2.49
Total Fuse, etc.			16.67

Total All Explosives Rock Development, Etc.	62.67
Total All Explosives Used in Mine	7541.99
Average Price Per Pound for Powder	.115
Explosives Used for Stopping and Development	7541.99
Transferred to General Supplies	639.50
Total as Per Cost Sheet	8181.49

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7. UNDERGROUND: (CONT.)

g. Mining and Loading:

There were many operating conditions in the mine that reduced efficiency and immediate steps were taken to correct them. There was no serious or effective control of water which resulted in extra expense in handling the ore from the mining area until it reached the stockpile on surface. The ore could not be accumulated in the raises, and spillage at the raises, along the haulage roads, in loading the skips, and on surface from the larry car was a constant source of expense. Within a few months nearly all of the water was under control and dry ore was hoisted. Instead of the stockpile literally running out to widths of over a hundred feet on both sides of a trestle only thirty-two feet in height, it now stands in the normal angle of repose under the trestles.

In order to avoid the expense of putting up raises the former operators handled the ore from as many as five contracts through mill raises above transfer drifts. In some areas where the ore extended beyond possible scraping distance an auxiliary transfer was in use to bring the ore to a point where it could be moved on the main transfer. Usually only one raise connected the transfer drift with the main haulage level. In some cases to further complicate the operation a sub-level was opened twenty feet above the haulage level, the ore discharged on this sub-level and scraped forty feet or more to another raise from the main haulage level. If the ore was not wet at the point where it was mined it almost always came in contact with water at some point on its journey to the haulage cars. The handling of supplies was quite a problem on the transfer sub-levels as it stopped the movement of ore and as a result the miners were often idle waiting for supplies. This unsatisfactory condition has been largely eliminated and within the next six months will be entirely done away with.

The former operators had a few modern scraper hoists with many old, slow speed models. Among them were a number of Gardner Denver, worm gear driven electric hoists of ten and fifteen horsepower. These have not been manufactured for a number of years and spare parts are not available. Repair costs of these machines years ago, when parts were available, were almost prohibitive and this make of hoist has been scrapped at all of the Company mines. There were also some under-powered Sullivan Scraper Hoists for which twenty-five horsepower continuous rated motors have been ordered. When these new motors are installed there will be four first class hoists added to the number now at the mine. Several twenty and twenty-five horsepower new hoists were purchased from other Company mines and these with the six new ones ordered but not yet received will provide a sufficient number until the mine is in a position to increase production.

h. Ventilation:

Ventilation in the mine is now provided by a fan of 20,000 cubic feet per minute capacity located on the Sixth Level. Fresh air is drawn into the mine through a cave to surface and exhausted to surface, after it passes through the area being mined, via the operating shaft known as No. 2 Hartford. Future plans for ventilation call for a joint ventilation system with the Mather Mine which will be the downcast shaft and the Cambria-Jackson the up-cast shaft. This joint system must wait for the mines to be connected on the Seventh Level, Cambria-Jackson, and the 1600 Foot Level, Mather Mine which will probably occur late in 1944. An Aerodyne fan of 35- to 45,000 cubic

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7. UNDERGROUND: (CONT.)

h. Ventilation: (Cont.)

foot capacity, (depending on the blade adjustment) operating against water pressure of 2.8 inches will be installed in the Mather Mine near the Cambria property line. This unit should provide ventilation for both mines for a number of years. Several booster fans were in use for several months after June 1st until raises were completed which provided access of air to the sub-levels.

i. Pumping:

The number of gallons pumped per minute in each month of the year for the past four years are shown in the following statement:

<u>Month</u>	<u>1943</u>	<u>1942</u>	<u>1941</u>	<u>1940</u>
January	369	413	374	332
February	340	387	342	326
March	335	375	340	309
April	433	430	392	330
May	619	477	435	555
June	620*	465	424	540
July	583	421	407	513
August	411	379	390	481
September	395	362	382	461
October	402	391	386	431
November	340	394	419	400
December	340	386	459	374
Average gallons per minute:	432	407	396	421

* Figures for June to December taken from Cleveland-Cliff Iron Company records, all others from Republic Steel Corporation records.

It will be noted that the largest number of gallons pumped per minute was in June, 1943, and the smallest in March, 1940. Less water was pumped in 1941 while in 1940 and 1943 the total water pumped was nearly the same. The statement shows a considerable variation to exist in certain months of the year--depending on rainfall and depth of snow in the spring, also on the time of the spring thaw. Comment has been made elsewhere in this report of the drainage ditches dug last fall to prevent water from entering the caves to surface that connect to the mine workings. It will be interesting to note the effect of the ditching program on the gallons of water pumped in 1944.

About two years ago the Republic Steel Corporation made some improvements to the main pumping plant on the Fourth Level. The sump was enlarged and drifts driven to provide means for cleaning the sump. Prior to this time the main sump was very small and in case of accidents to pumping equipment or to the power lines on surface, dams had to be installed in the mine to impound the water in the haulage drifts.

The pumping plant on the Seventh Level, consisting of an Aldrich Plunger pump with a centrifugal as a spare, pumps water to the Sixth Level and from the Sixth Level it is relayed by two centrifugal pumps to the main plant on the Fourth Level. The sumps on the Sixth and Seventh Levels are quite ^{small} and only have a few hours storage capacity. For this reason the pumping plants have to be operated three shifts per day. With a larger sump on the Seventh Level and pumps

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7. UNDERGROUND: (CONT.)

i. Pumping: (Cont.)

that would throw the water up to the main plant on the Fourth Level it would probably be possible to operate the plant 2-3 hour shifts per twenty-four hours at least in the winter months when the water does not exceed 400 gallons per minute. Further study of the pumping situation will be made in 1944 to determine if a more economical operation is possible.

j. Underground in General:

The subjects that normally would be commented on under this heading have been discussed in a large measure under other headings and only a few will be taken up in the following paragraphs.

When the mine changed management the levels were in bad condition due to mud on the tracks and in the ditches. One of the many jobs undertaken immediately was to clean up the accumulation of mud and other material scattered throughout the mine. Two old discarded haulage locomotives were sent to surface and sold as scrap. The underground tram cars were in bad condition and were overhauled as rapidly as possible in the mine. More cars are needed but they can not be obtained until after the war. The tracks in the mine are 24" gauge and the cars have a capacity of 2.3 tons. Tracks in all of the other Company mines are 30" gauge and the cars have a capacity of four tons. The narrow gauge of the tracks makes it impossible to transfer idle cars from other Company mines. The underground haulage locomotives in use are manufactured by three different companies, making it necessary to carry more than a normal amount of repair parts for the locomotives and the motors.

There were only two timber trucks in the mine on June 1st, 1943. Fortunately several 24" gauge trucks had been shipped to the mine from a mine on the Gogebic Range abandoned by the Republic Steel Corporation. These trucks were overhauled and put in service as rapidly as possible. They are used for hauling timber, lagging, poles and planks from the shaft to the raises in the areas being mined. More timber trucks will be needed as soon as the balance of the gangs start mining on the top slicing system. Wheels and axles have been ordered and additional trucks will be built as soon as possible.

It must be borne in mind that delivery of all new equipment is delayed for months, consequently improvements in operating conditions take more time than would have been required prior to the war. The shortage of labor has slowed the progress of the work of repairing the underground equipment but delays from this cause have been kept at a minimum.

The shaft was inspected very carefully on taking over the mine and found safe to use. The runners in the skip roads, (at this mine also the cage roads) were gauged and the runners found to be in fairly good condition. Worn ones are being replaced on week-ends. Other repairs to the shaft will be made in 1944. Some sections have not been cased on the ladder road side and this work will be given early attention.

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8. COST OF OPERATING:

a. Comparative Mining Costs:

<u>PRODUCT</u>	<u>7 months---1943</u>	
	147,700	Tons
Underground Costs	\$2.008	
Surface Costs	.329	
General Mine Expense	.321	
Cost of Production	<u>2.658</u>	
Taxes		
	.175	
Depletion and Depreciation		
	.055	
Loading and Shipping		
	.076	
<u>Total Cost</u>	<u>2.964</u>	
No. of Days Operated		
	180	
Total No. of Shifts Operated		
	352	
Average Daily Product		
	821	Tons
Average Product Per 8 hour Shift		
	419	"

COST OF PRODUCTION:

	<u>1943</u>	<u>%</u>
Labor	1.838	.691
Supplies	.820	.309
<u>Total</u>	<u>2.658</u>	<u>100.00</u>

b. Detailed Cost Comparison:

(1) Days and Shifts:

<u>Year</u>	<u>Days Mine Worked</u>	<u>Shifts & Hours</u>	<u>Men Employed</u>	<u>Total</u>
1943	180	1,2,&3-8-Hour	212	34,562 $\frac{3}{4}$

(2) Wages:

There was an increase in wages of .05 $\frac{1}{2}$ cents per hour effective April 1st, 1943, retroactive to July 13th, 1942.

(3) Comparison of Production:

Production - 1943 147,700 Tons

(4) Comparison of Number of Men and Wages:

<u>Year</u>	<u>No. Men</u>	<u>No. Days</u>	<u>Amount</u>	<u>Rate per Day</u>
1943	212	34,562 $\frac{3}{4}$	263,856.11	7.63

(5) Tons Per Man Per Day:

	<u>1943</u>
Surface	14.57
Underground	6.05
<u>Total</u>	<u>4.27</u>

(6) Cost of Production:

<u>7 Months - 1943</u>	<u>Total</u>	<u>Cost Per Ton</u>
	\$437,785.12	2.964
	<u>Labor</u>	<u>%</u>
7 Months - 1943	\$280,043.84	64
	<u>Supplies</u>	<u>%</u>
	\$157,741.28	36

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8. COST OF OPERATING: (CONT.)

b. Detailed Cost Comparison: (Cont.)

(7) Detail of Accounts:
7 months - 1943

Days Per Week	6	
Shifts & Hours	352	1, 2 & 3-8-hr.
Production - Tons	147,700	
Avg. Daily Product - Tons	821	
No. Days Worked-6/1/43 to 12/31/43	180	

	<u>Amount</u>	<u>Per Ton</u>
<u>UNDERGROUND COSTS:</u>		
1. Exploring in Mine	3168.61	.022
2. Sinking in Shaft		
3. Development in Rock	1064.28	.007
4. Development in Ore	5750.55	.039
5. Stopping	108920.54	.738
6. Timbering	79816.68	.541
7. Trimming	36095.47	.244
8. Ventilation	3460.26	.023
9. Pumping	16717.32	.113
10. Compressors & Air Pipes	16889.55	.114
11. Back Filling	86.40	.001
12. Underground Superintendence	5978.55	.040
13. Cave-In		
14. Maint: Comp. & Power Drills	906.76	.006
15. Scraper Equipment	7177.94	.049
16. Elec. Tram Equipt.	8740.83	.059
17. Pumping Machinery	1829.65	.012
Total Underground Costs	<u>296603.39</u>	<u>2.008</u>
<u>SURFACE COSTS:</u>		
18. Hoisting	14029.37	.095
19. Stocking Ore	10025.35	.068
20. Screening-Crushing at Mine		
21. Dry House	8984.01	.061
22. General Surface Expense	6975.74	.047
23. Maint: Hoist Equipment	3958.61	.027
24. Shaft	758.88	.005
25. Top Tram Equipment	2042.26	.014
26. Docks, Trestles; Pockets	1782.12	.012
27. Mine Buildings	44.61	
Total Surface Costs	<u>48600.95</u>	<u>.329</u>
<u>GENERAL MINE EXPENSE:</u>		
Employees Vacation Pay	1532.57	.010
28. Insurance	1356.91	.009
29. Minign Engineering	2524.12	.017
30. Mech. & Elec. Engineering	1091.04	.007
31. Analysis & Grading	6421.06	.043
32. Personal Injury	4551.35	.031
33. Safety Department	607.26	.004
34. Telephones & Safety Devices	1201.60	.008
35. Local & General Welfare	1428.94	.010
36. Spec. Exp., Pensions & Allowances	2448.12	.017
37. Ishpeming Office	6279.25	.043
38. Social Security Taxes	5820.24	.039
39. Mine Office	12091.96	.082
40. Supply Inv. Adj.	84.80	.001
Total General Mine Expenses	<u>47439.22</u>	<u>.321</u>
<u>COST OF PRODUCTION</u>		
41. Taxes	25889.43	.175
TOTAL COST	<u>418532.99</u>	<u>2.833</u>