

LLOYD MINE  
ANNUAL REPORT  
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7. UNDERGROUND (Cont.)

f. Explosives, Drilling and Blasting (Cont.)

<u>Breaking Ore</u>	<u>Quantity</u> <u>Lbs</u>	<u>Average</u> <u>Price</u>	<u>Amount</u> <u>1939</u>	<u>Amount</u> <u>1938</u>
Fuse, Feet	507,604	5.05	2,561.53	2,471.01
#6 Blasting Caps	72,033	12.18	877.01	723.96
Tamping Bags	7,500	2.00	15.00	17.00
Fuse Lighters	9,950	6.75	67.17	85.58
Fuse Cartridges	4,150	20.23	83.97	
Total Fuse, Caps, etc.			3,604.68	3,297.55
Total Explo. Breaking Ore			20,992.82	20,357.38
Product, Tons			317,055	272,992
Lbs. Powder per Ton of Ore			.465	.510
Cost per Ton for Powder			.055	.062
Cost per Ton for Fuse, Caps, etc.			.011	.012
Cost per Ton all Explosives			.066	.075
<u>DEVELOPMENT IN ROCK</u>				
Gelamite Powder #1	2,871		336.42	229.71
Gelamite Powder #2				24.50
Total Powder	2,871		336.42	254.21
Fuse, Feet	12,937		65.35	37.78
#6 Blasting Caps	1,783		21.67	11.22
Tamping Bags	500		1.00	
Fuse Lighters	800		5.41	
Fuse Cartridges	100		2.00	
Total Fuse, Caps, etc.			95.43	49.00
Total all Explosives			431.85	303.21
Rock Drifting, Feet			525'	257'
Cost per Foot for Powder			.641	.989
Cost per Foot for Fuse Caps, etc.			.182	.191
Cost per Foot all Explosives			.823	1.180
Grand Total all Explosives used in Mine			21,424.67	20,660.59
Cost per Ton all Explosives used			.068	.076
Average Price per Pound for Powder			.1180	.1225

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7. UNDERGROUND (Cont.)

g. Ventilation

The installation of the new mine ventilation fan on the 4th Level at the bottom of the Section 6 shaft in June, the opening of 2 new rock raises between the 4th and 5th Levels, and the maintenance of an open connection the full length of the mining sub above the 5th Level, resulted in as close to ideal underground air conditions in 1939 as normal operations allowed. Previous to the installation of the main fan, the Lloyd Mine natural ventilation system (except for freezing the downcast Lloyd shaft) was good in the cold weather, but dropped off proportionately to a minimum of 4000 to 5000 cu. ft. per minute on warm days.

The Sturtevant 60" reversible disc fan seems exactly suited to the system. It was designed to aid the natural ventilation, but tests have shown that it also circulates nearly the rated volume against this pressure. This advantage has been utilized as follows: the fan is reversed during the greater part of the working shift to circulate approximately 23,000 cu. ft. per minute, maintaining pressure to hold the decomposition heat up in the timber mat, and at the same time thaw the Lloyd shaft; then during the blasting time of about a one hour interval, the fan rotation in the direction of the natural ventilation system sweeps the powder smoke up the Section 6 shaft at the rate of nearly 30,000 cu. ft. per minute in an extremely diluted form. The men can return to their working places within 10 or 15 minutes in a perfectly clear atmosphere, and this time saving alone in the mining cycle is believed to have returned the fan cost in a very short while. The care and operation of the fan was made the responsibility of the 4th Level motorman on each shift, and the timing has been watched carefully by these men.

The ventilation drifts and raises were for the most part more than adequate to handle the desired volume. The 4th to 5th Level raises were the only restriction, and the permanent ventilation and traveling raise at the east end had been completed in February prior to the installation of the fan. These full-sized openings explain the small 15 H.P. drive motor and its ability to force the comparatively large volume of air in either direction. The main air current is split by regulator doors to reach all contracts except the 3 on a separate circuit above the east end of the 4th Level. Here fresh air is picked up by a small 5 H.P. booster fan and forced directly to the working sub, the ladder compartments of the raises providing the return. The main fan installation under this system required no ventilation doors on the 5th and 6th Levels, so that the tramming remained unhampered on these levels which are the main source of production.

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8. COST OF OPERATING

a. Comparative Mining Costs

	<u>1939</u>	<u>1938</u>	<u>Incr.</u>	<u>Decr.</u>
Product, Tons	317,055	272,992	44063	
Underground Costs	.979	1.005		.026
Surface Costs	.146	.196		.050
General Mine Expense	.250	.257		.007
Cost of Production	1.375	1.458		.083
Depreciation	.047	.047		
Taxes	.143	.198		.055
Loading and Shipping	.079	.016	.063	
Total Cost at Mine	1.644	1.719		.075
Budget Estimate at Mine	1.642	1.707		.065
Number of Operating Days	227	241		14
Number of Shifts & Hours	37, 1-8 Hr. 190, 2-8	116, 1-8 Hr. 123, 2-8 2, 3-8		
Average Daily Product	1397	1133	264	

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8. COST OF  
OPERATING (Cont.)

	<u>1939</u>		<u>1938</u>	
	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>
1. Exploring in Mine	302.71	.001	213.03	.001
3. Development in Rock	3595.94	.011	1857.21	.007
4. Development in Ore	26798.33	.085	23743.13	.087
5. Stopping	117990.08	.372	99742.90	.365
6. Timbering	78221.44	.247	68462.21	.251
7. Trammig	33857.22	.107	29383.68	.108
8. Ventilation	811.99	.003	592.29	.002
9. Pumping	10518.71	.033	11267.02	.041
10. Compressors and Air Pipes	15136.58	.047	16369.57	.060
12. Underground Superintendence	10949.86	.035	10858.62	.040
14. Maint. Comp. & Air Drills	756.48	.002	690.78	.002
15. Scrapers & Mech. Loaders	5439.00	.017	4569.65	.017
16. Electric Tram Equipment	5704.41	.018	5701.27	.021
17. Pumping Machinery	254.37	.001	911.32	.003
Total Underground Costs	<u>310337.12</u>	<u>.979</u>	<u>274362.68</u>	<u>1.005</u>
18. Hoisting	17546.06	.055	18139.88	.067
19. Stocking Ore	8369.19	.026	8970.69	.033
20. Crushing at Mine	883.73	.003	1358.18	.005
21. Dry House	5870.80	.019	4936.40	.018
22. General Surface Expense	5418.89	.018	5784.70	.021
23. Maint. Hoisting Equipment	2631.06	.008	3913.66	.014
24. Shaft	1608.91	.005	1050.00	.004
25. Top Tram Equipment	1982.56	.006	2971.82	.011
26. Docks, Trestles & Pockets	621.84	.002	5741.83	.021
27. Mine Buildings	1144.23	.004	523.21	.002
Total Surface Costs	<u>46077.27</u>	<u>.146</u>	<u>53390.37</u>	<u>.196</u>
Vacation Expense	3793.15	.012	2601.39	.010
28. Insurance	2230.30	.007	161.27	.001
29. Mining Engineering	2651.92	.008	2459.52	.009
30. Mech. & Elect. Engineering	1996.38	.006	1689.71	.006
31. Analysis and Grading	8913.46	.028	6093.99	.022
32. Personal Injury	9999.00	.031	9543.41	.035
33. Safety Department	1192.66	.004	1328.19	.005
34. Telephones and Safety Devices	1226.01	.004	1438.36	.005
35. Local and Gen. Welfare	5917.56	.019	6389.84	.024
36. Spec. Exp. Pensions & Allow.	5586.82	.018	5032.83	.018
37. Ishpeming Office	11600.97	.037	10367.38	.038
38. Social Security Taxes	11545.49	.036	10430.71	.038
39. Mine Office	12756.54	.040	12614.15	.046
Total General Mine Expense	<u>79410.26</u>	<u>.250</u>	<u>70150.75</u>	<u>.257</u>
Cost of Production	435824.65	1.375	397903.80	1.458
40. Taxes	45389.57	.143	53882.69	.198
Total Cost	<u>481214.22</u>	<u>1.518</u>	<u>451786.49</u>	<u>1.656</u>
Budget Estimated Cost		1.524		1.633

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8. COST OF OPERATING (Cont.)

	<u>1939</u>		<u>1938</u>	
	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>
41. General Supplies	22293.98	.070	25289.81	.093
42. Iron and Steel	4148.91	.013	3910.65	.015
43. Oil and Grease	1279.69	.004	1177.60	.004
44. Machinery Supplies	6660.93	.021	5854.48	.021
45. Explosives	21424.67	.068	20660.59	.076
46. Lumber and Timber	22366.79	.071	19700.94	.072
47. Fuel	1725.16	.005	2100.99	.008
48. Electric Power	28956.18	.091	29590.36	.108
49. Sundries	6905.06	.022	2247.12	.008
50. Other Mines and Accounts	<b>152.22</b>	<b>.000</b>	<b>252.41</b>	<b>.001</b>
Total per Cost Sheet	115609.15	.365	110280.13	.404

The following explanation of comparative costs includes only the accounts which vary from last year, and are therefore of interest:

3. Development in Rock

Charged to this account in 1938 were 257' of rock drifts and raises at \$7.23 per foot, and 525 feet in 1939 at \$6.85 per ft. The work included the new ventilation and traveling raises between the 4th and 5th Levels, and the development preparatory to reopening the Lloyd orebody above the 4th Level. The large increase in footage raised the cost per ton from .007 to .011.

5. Stoping

The reduced proportion of ore from sub level stoping operations in 1939 had the effect of reducing the tons per man, yet maintaining the average contract rate at the same level as last year, and increasing the timber cost. The largest single increase was in the mine labor, and the total stoping cost was .372 per ton compared to .365 in 1938. The detail of this account, excluding ore from development, follows:

	<u>1939</u>		<u>1938</u>	
	<u>Amount</u>	<u>per Ton</u>	<u>Amount</u>	<u>Per Ton</u>
General Supplies	6,331.49	.022	5,576.10	.022
Iron and Steel	1,283.86	.004	1,621.94	.006
Oils & Greases	272.97	.001	277.55	.001
Machy. Supplies	1,592.92	.005	937.18	.004
Explosives	16,395.64	.056	15,774.36	.063
Lumber & Timber	13.06	.000	98.21	.001
Electric Power	574.86	.002	296.91	.001
Sundries	1,000.39	.003	340.91	.001
Expense Accounts	293.68	.001	99.11	.001
Total Supplies	27,758.87	.094	25,022.27	.100

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8. COST OF OPERATING (Cont.)

<u>5. Stopping (Cont.)</u>	<u>1939</u>		<u>1938</u>	
	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>
Payroll Labor	87,658.47	.297	71,673.31	.286
Cliffs Shaft Labor	176.39	.001	91.41	.001
General Shops Labor	2.54	.000	874.08	.003
Shops, Labor Etc.	<u>2,393.81</u>	<u>.008</u>	<u>2,081.83</u>	<u>.008</u>
Total Labor	90,231.21	.306	74,720.63	.298
 GRAND TOTAL	 117,990.08	 .400	 99,742.90	 .398
 Production Tons Stopped	 294,287		 250,724	
Avg. Miners Rate for Stopping		7.22		7.22
Avg. Tons per Man Stopping		26.71		27.90

6. Timbering

The timbering expense was nearly \$10,000 above last year, but the lower cost of repair work under the more regular working schedule, and the increased production, reduced the cost per ton from .251 to .247.

8. Ventilation

The cost of operating the main ventilation fan during the last 6 months was largely responsible for the small increase in the cost per ton. The improved underground working conditions during the summer months repaid this increase many times over.

9. Pumping

During the last 2 years the pumping cost has been less in spite of an increase in the average quantity handled. The Morris Mine continued pumping the water from both properties, the cost allocation being made from daily weir readings which were averaged each month and checked by the pump calculations. The Lloyd Mine average quantity increased from 159.7 to 174.2 gal. per minute, the Morris from 568.2 to 787.7. This reduced the percentage of Lloyd Mine water from 21.91 in 1938 to 18.1% in 1939, and with the increased efficiency because of the much larger quantity handled, reduced the Lloyd cost from \$11,267.02 to \$10,518.71. The comparative statement follows:

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8. COST OF  
OPERATING (Cont.)

9. Pumping (Cont.)

		<u>Inland Steel Co.</u>			<u>C.C.I. Co.</u>		
		<u>Amount</u>	<u>Per Cent</u>	<u>Avg. Gal. Per Min.</u>	<u>Amount</u>	<u>Per Cent</u>	<u>Avg. Gal. Per Min.</u>
Total -	1939	44,044.09	81.90	787.7	10,518.71	18.10	174.2
	1938	39,606.07	78.09	568.2	11,113.14	21.91	159.7
	1937	30,636.14	69.05	360.1	13,731.40	30.95	137.6
	1936	14,887.49	61.20	208.0	9,446.76	38.80	137.0
	1935	8,864.80	51.40		8,384.18	48.60	

The dry spell in November and December reduced the Lloyd Mine quantity to the lowest monthly average in several years, and the effect of this will probably continue through the Winter months. The increase at the Morris also levelled off, and it is hoped the combination will benefit the situation in the Spring, for it will be difficult to make the Lloyd plant completely independent of the Morris before that time.

10. Compressors and Air Pipes

The amount, and the cost per ton, were less than last year because of the lower rate for power and the better distribution of engine house labor under the more even working schedule. The following table shows the comparison:

	<u>1939</u>	<u>1938</u>
Operating Compressors	11,658.68	13,082.05
Air Pipes	3,477.90	3,287.52
Total	15,136.58	16,369.57
Cost per 1000 Cu. Ft.	.054	.056
Cost per Ton	.048	.060

12. Underground Superintendence

The number of bosses, their rate, and the amount was nearly identical in each year. The larger production in 1939 therefore reduced the cost per ton from .040 to .035.

16. Maint. Electric Tram Equipment

The necessary repairs and the cost was the same in each year, so here again the amount per ton declined because of the larger production in 1939.

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8. COST OF  
OF OPERATING (Cont.)

17. Maint. Pumping Machinery

The work in connection with the underground dams between the Morris and Lloyd Mines and the 5th Level relay pump was not recurrent in 1939. The amount was reduced considerably, and the cost per ton from .003 to .001.

18. Hoisting and Maint. of Hoisting Equipment

The expense under both these headings was less, the first principally because of the lower rate for power, and the second because only one new hoisting rope was purchased in 1939. The comparative statement follows:

	<u>1939</u>	<u>1938</u>
Total Operating	17,546.06	18,139.88
Maintenance	2,631.06	3,913.66
Total Opt. & Maint.	20,177.12	22,053.54
Tons Rock & Ore Hoisted	323,628	286,864
Avg. Depth Hoisted	900	900

19. & 26. Stocking Ore and Maint. Trestles and Pockets

A total of 203,152 tons were stocked in 1938 compared to 154,904 tons in 1939. This reduced the operating charge from .033 to .026 per ton on the increased 1939 production. The preparation of the new southeast stocking grounds, and purchase of additional timber for the trestles in this area, increased the cost abnormally that year, so this account also showed a large reduction.

20. Screening and Crushing at Mine

Although the grizzly was improved by extension, there were less repairs on the crusher, so the cost per ton was down from .005 to .003.

21. Dry House

The amount was in proportion to the small increase in the average working schedule, so the cost per ton was about the same in each year.

22. General Surface Expense

The expense in connection with the planting, and improvement of the general surface appearance, was less than in 1937 and 1938. The amount and the cost per ton were correspondingly decreased.

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8. COST OF  
OPERATING (Cont.)

25. Maint. Top Tram Equipment

The reduced amount in 1939 was due to the fact that the shop charges on a new saddle back tram car had been made late last year. Less 5/8" tram cable was purchased, so the total amount was nearly \$1000 under 1938 and the cost per ton down from .011 to .006.

27. Mine Buildings

The fireproofing and improvement of the entrance room of the cage road, and construction of the coal bin at the north end of the main building increased this expense from .002 to .004 per ton.

Vacation Expense

There were a few additional men who received vacations with pay, and the number of days was increased to 4 from 3, so the cost was \$3793.15 compared to \$2601.39.

28. Insurance

The allowance of a large credit on the group insurance in Dec. 1938 reduced the cost below normal that year. The amount and cost per ton were therefore up sharply in 1939.

31. Analysis and Grading

The large increase in the amount of ore shipped was responsible for the increase from .022 to .028 per ton produced.

32. Personal Injury

While the amounts for compensation and doctors, and proportion of hospital operating loss were a little higher than last year the cost per ton on the larger production declined from .035 to .031.

33, 34. Safety Department and Safety Devices

The amounts under both these headings were a little less than in 1938, and the cost per ton reduced from .005 to .004.

35. Local and General Welfare

The cost of operating the North Lake Club House was increased in 1938 when class rooms were provided after the school was destroyed by fire. The normal expense in 1939 brought a decrease in the cost per ton from .024 to .019.

36. Special Expense, Pensions and Allowances

The expense of the new retirement fund added to the amount, but the increase in production maintained the cost at .018 per ton.

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8. COST OF  
OPERATING (Cont.)

38. Social Security Taxes

The proportional increase in the amount was a little less than the production increase so the cost per ton was .036 compared to .038 last year.

39. Mine Office

The expense was about the same with only one small salary adjustment made, so the cost per ton declined from .046 to .040.

9. EXPLORATIONS AND  
FUTURE EXPLORATIONS

The start of mining operations above the 6th Level in 1939 brings up the alternative of locating additional reserves above this level; or sinking the Lloyd shaft to skip pit below, and then completing development of the 7th Level.

Exploration in line with the first of these alternatives was begun in December by drifting through the south footwall dike on the 6th Level to test the formation between this dike and the faulted slate farther south. Two drill holes at the 7th Level elevation disclosed an 8' seam of low phos. ore, and the 6th Level test drift proved the upward extension, but as a leaner material. The drift will be continued until it intersects the slate. Here it is planned to cut out a station for diamond drilling the area farther south, which has not been tested below the 3rd Level and appeared promising at that elevation.

A second exploration is proposed for the west end of the 6th Level to test the possibility of an upward extension of ore on the fault which forms the west boundary of the main orebody on the 7th Level. A drill hole south from the rock drift will secure this information at small expense.

The disclosure of additional ore in either of these areas will be of particular advantage at this time because of the demands of the expanded production schedule.

10. TAXES

The following figures show the taxes paid in Ishpeming Township for the past two years on the Lloyd Mine, on lots in West Ishpeming, and on property in the North Lake Location:

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10. TAXES (Cont.)

	1939		1938	
	Valuation	Taxes	Valuation	Taxes
<u>Lloyd &amp; Section 6</u>				
SW $\frac{1}{4}$ of NW $\frac{1}{4}$ of Sec. 6, 47-27)				
N $\frac{1}{2}$ of SW $\frac{1}{4}$ of Sec. 6, 47-27)	1,425,000	29,051.63	2,135,000	43,635.55
N $\frac{1}{2}$ of SE $\frac{1}{4}$ of Sec. 6, 47-27)				
Personal, Ore in Stock, Supplies, Equip.	775,000	15,800.00	465,000	9,504.41
Total	2,200,000	44,851.63	2,600,000	53,139.96
Collection Fees		448.52		531.40
Total Republic Lease		45,300.15		53,671.36
<u>C.C.I. Co. Lands Misc.</u>				
S $\frac{1}{2}$ of NE of Sec. 6, 47-27	320	6.52	320	6.52
SE $\frac{1}{4}$ of NW $\frac{1}{4}$ of Sec. 6, 47-27 Except R of W.	350	7.13	350	7.16
S $\frac{1}{2}$ of SW $\frac{1}{2}$ of Sec. 6, 47-27 " " "	700	14.28	700	14.32
SW $\frac{1}{4}$ of SE $\frac{1}{4}$ of Sec. 6, 47-27 " " "	350	7.13	350	7.16
SE $\frac{1}{4}$ of SE $\frac{1}{4}$ of Sec. 6, 47-27 " " "	575	11.74	575	11.74
Total	2,295	46.80	2,295	46.90
Collection Fees		.47		.47
Total CCI Co. Misc.		47.27		47.37
Lloyd Mine	2,202,295	45,347.42	2,602,295	53,718.73
Personal Ore, Morris Mine		42.15		163.96
Total Taxes, Lloyd Mine		45,389.57		53,882.69
Lots in West Ishpeming	30	.61	25	.52
<u>North Lake Dwellings</u>				
Houses on Section 6, The CGI Co.	40,500	825.68	40,500	827.81
Collection Fees		8.26		8.28
Total Dwellings		833.94		836.09
Total Ishpeming Township Rate	2,242,825	46,181.97	2,642,820	54,555.34
		2.039		2.05

The proved reduction in ore reserves from 1937 to 1939 by development of the 6th Level brought a decrease in valuation this year of \$400,000. With the rate remaining about the same, the total taxes paid were down to \$45,389.57 from \$53,882.69 in 1938.

The comparative tax payments based on the varying production and shipment cycles are interesting. The following table shows the figures for the past three years.

	1939	1938	1937
Tax Paid per Ton Produced	.143	.198	.059
Tax Paid per Ton Shipped	.095	.479	.0497

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11. ACCIDENTS AND  
PERSONAL INJURY

There were 3 compensable accidents in 1939 compared to 5 last year. Because there were 3 crews employed during the first half of 1938 there was little difference in the total number of man-shifts worked in each of the 2 years. This brought another reduction in the frequency rate from .122 per thousand days worked in 1938 to .070 in 1939. The 10 month interval from April 14, 1938 to Feb. 13, 1939 was worked without a lost time accident. The record was spoiled by an employee slipping and falling while walking along the 6th Level drift, the resultant injury being a hernia. The 2 other accidents were leg injuries, one from a chunk of ore falling from the side of a drift, and the other a piece of wood blocking from the back. A fourth accident resulted from the last named cause, but there was only 4 days loss of time in this case due to infection.

The severity rate was slightly higher in 1939 because the minimum time loss was 71 days in the hernia case. The comparison was 5.85 days lost per 1000 days worked in 1938, and 7.52 days per 1000 in 1939. The constant effort to improve these figures was emphasized by the withholding of bonus payments to bosses for non-enforcement, or infraction of the rules. The fact that there were but few instances where this was necessary shows that attention was paid to this extremely important part of their work.

The accident list in detail follows:

Accident No. 798 - Matt Kallio, underground laborer. Slipped and fell, causing a hernia. Time lost Feb. 13 to May 8, total 71 days.

Accident No. 799 - William Haglund, contract miner. Chunk of ore fell from side of drift injuring right ankle. Time lost April 11 to Sept. 5, total 125 days.

Accident No. 802 - Heino Wuorie, contract miner. Piece of timber blocking fell from back of drift injuring right ankle. Time loss from Nov. 30 estimated at 120 days.

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12. NEW CONSTRUCTION AND  
PROPOSED NEW CONSTRUCTION

A few small construction jobs since 1937 have been more in the nature of repairs or improvements to existing units. The fire-proofing of the cage road entrance under the headframe, the extension of the grizzly above the crusher, and the addition to the cooling pond have all ben described under the "Surface" heading. Also the construction of a steel bin for the black-smith's coal, and the erection of the 24 bent stocking trestles on both sides of the shaft. The installation of the ventilating fan underground, which is listed under the next heading, necessitated only the construction of a concrete frame and steel door on the 4th Level near the bottom of Section 6 shaft. Expenditures coniduned under E.&A. No. 752 - Development of the 6th Level, and a reduced amount of rock drifting and raising will also go forward in 1940.

Preliminary work was started at the end of the year under E.&A. No. 857 covering the cost of a pumping plant on the 5th Level. This installation, which will make the Lloyd entirely independ-ent of the Morris pumping plant, includes under the construction heading the cutting of a sump and pump house on the 5th Level, the installation of an 8" discharge column in the shaft, and a 10" line on surface for a distance of approximately 800'. The total expenditure, the cost of equipment also included is esti-mated at \$26,400 and the work is to be completed in 1940.

13. EQUIPMENT AND  
PROPOSED EQUIPMENT

Additions to equipment under E.&A. No.s 814 and 851 were as follows:

	<u>Amount</u>	<u>Amount</u>
	<u>Authorized</u>	<u>Expended</u>
814 - Main Ventilation Fan	\$ 1032.00	\$ 981.58
851 - Equipment to Increase Production	6132.00	5938.57

The installation of the fan was authorized March 28th, and the work completed in June. The purchase of the following equipment for increasing production was authorized Oct. 27th, and at the end of the year it was all in use:

3, 15 H.P. Ingersoll-Rand Scraper Hoists at	\$1374.00 each
6, R.A.-12 " " Wet Drilling Machines at	215.53 each
2, S-49 " " Jackhammers at (Wet)	215.53 each

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13. EQUIPMENT AND  
PROPOSED EQUIPMENT (Cont.)

A new hoisting rope was purchased for the cage in 1939, and a new saddle back car added to the top tram system at the beginning of the year. Underground timber haulage delays were reduced to a minimum by the addition of 5 new timber trucks, and drill steel breakage cut down by the purchase of a shank grinder for squaring the ends of the rods. A high speed electric bench grinder was also added to the shop equipment to replace an old style unit. The following is a list of the more important items added to the inventory in 1939:

1 Top tram saddle back car	\$ 912.97
1 1720', 1 1/2" Hoisting Rope	635.67
1 4K Ingersoll Rand Shank Grinder	125.73
1 Electric Bench Grinder	85.84
5 Timber Trucks	556.60
4 Circuit Breakers	117.30
4 Fire Extinguishers	88.70

The Armstrong loader purchased in 1922 at a cost of \$2800 and 8 of the old style saddle back haulage cars were scrapped in 1939. Two of the smaller 36 cu. ft. rocker dump cars were transferred to the Cliffs Shaft Mine, and the 2 H.P. Moyno sludge pump for use in the skip pit at the Spies-Virgil Mine.

The proposed equipment included in the pumping plant E. & A. No. 857 is the 8" discharge column from the 5th Level to the 10" line on surface. The estimated cost, including installation and rearranging of the present pumping plant is estimated at \$7200. The main plunger pump is to be transferred from the Stephenson Mine equipment, refitted for use at the Lloyd and installed at an estimated cost of \$5200. The total estimated expenditure of \$26,400 for the complete plant also includes \$2500 for the necessary power cables, transformers and other electrical equipment.

One other equipment proposal should be made in regard to direct current generation for haulage motors, scraper hoists, underground lighting etc. One of the 2 converter units is now loaded to capacity and must be maintained for constant use, for the second is not of sufficient size to supply the regular operating demand. The electrical department will propose a transfer of the small converter to the central shops, and the purchase early in 1940 of a new motor generator set for the mine which will take care of future needs.

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14. MAINTENANCE AND REPAIRS

a. Mine

This work was not as extensive as in 1938 following the heavy production schedule of the year before. Improvement repairs, such as the fireproofing of the cage road entrance in the headframe, increased the expense in one or two instances, but on the whole the amount was lower than last year. The maintenance cost of the compressors and drilling machines, and of scrapers and loaders was exactly in proportion to last year. Fewer repairs on motors and cars, and on pumping equipment reduced the expense under both these headings from .021 per ton and from .003 to .001.

Shaft inspection and maintenance was about in proportion to production each year. Mine building repairs was the one surface cost considerably above last year's, but this was more than offset by lower crusher, hoisting equipment, and top tram equipment maintenance and repair charges. Operating equipment was maintained in good condition during 1939, but a segregation of the total expense shows a decline from .079 to .064 per ton.

Timber repairs and maintenance of underground openings was at the regular rate which, in the case of the Lloyd Mine, is comparatively slow due to the cool air retarding timber decay, and the harder ore reducing the pressure and crushing of raises and drifts. Relining the 4th Level drift leading to the east end with timber, and replanking a number of the 5th Level raises were perhaps the more important maintenance jobs.

b. Location

1. General Maintenance

The following table lists the costs of maintenance of the North Lake Location in 1939, and a comparison with former years:

	<u>Labor</u>	<u>Supplies</u>	<u>Total</u>
Prop. Policeman's Time	1708.97	8.30	1717.27
Cleaning	1063.22	28.48	1091.70
Sewers & Cess Pools	239.86	203.08	442.94
Water		1214.87	1214.87
Remove Snow & Ice	40.00	3.26	43.26
Fire Hydrants	10.00		10.00
Repair Fences	5.00	6.26	11.26
Water Mains	277.81	121.19	399.00
Water Tank		42.29	42.29
Recreation Grounds	35.71	36.59	72.30
Total	3380.57	1664.32	5044.89

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14. MAINTENANCE AND REPAIRS (Cont.)

<u>b. Location (Cont.)</u>	<u>Total</u>
Year - 1938	5272.04
1937	6109.82
1936	5952.21
1935	3248.22

The small reduction in the total resulted from fewer repairs to water mains, and a lower pumping expense in 1939. The cess pool cleaning charges increased for the 3rd successive year, and there can be no saving here until the necessary sewer system is installed in the location. The recreation expense included the flooding of a small area as a skating rink for the grade school children, and the lighting of the location Christmas tree.

2. Rented Buildings

The maintenance of rented buildings in the location in keeping with the Company's policy of attractive mine surface appearance necessitated a larger expenditure for this purpose than in 1938. The houses were painted in 1937 and repairs held to a minimum the following year. The gradual rotting of post and sill foundations is the cause of much of the regular maintenance for the placing of sheet rock over cracked plaster walls is a heavy expense in addition to the foundation repairs. The large proportion of the families take pride in their homes, and in keeping the interiors clean and neat, so this work will have to go forward gradually until the houses are refitted with this type of wall.

Roof repairs were also continued as a protection for the interior decorating done during the past several years. Many of the tenants have had storm sheds erected on an increased rental basis which returns the cost to the Company over a ten year period. Although modern heating and plumbing facilities are not provided in most of the location houses, the average rental charge is low compared to similar properties in Ishpeming and vicinity. The labor and supply cost of providing necessary repairs is considerably higher, so under these conditions it is difficult to foresee any change from the situation that over a period of years the rented building maintenance expense will outweigh the income from rents.

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14. MAINTENANCE AND REPAIRS (Cont.)

b. Location (Cont.)

2. Rented Buildings (Cont.)

The total expenditure and comparison with 1938 follows:

	<u>Labor</u>	<u>Supplies</u>	<u>Total</u>
1939	4152.82	4345.76	8498.58
1938	1252.80	3668.32	4921.12
Increase			3577.46

The 1939 expense was divided approximately as follows:

Painting and Interior Decorating	\$ 2698.58
Storm Sheds	2284.61
Sheet Rock	1523.08
Foundation Repairs	1142.31
Roof Repairs	850.00
Total	<u>8498.58</u>

15. POWER

The 2 small production delays resulting from power interruptions have been described under a previous heading.

The more even working schedule in 1939, and the attention paid to the maximum demand with the warning signal attached to this meter, resulted in a lower cost although power consumption increased. The average price per K.W.H. in 1938 was 1.741¢ and this was reduced to 1.677¢ in 1939. The total consumption as recorded by the master meter and the comparison with last year follows:

	<u>Total K.W.H.</u>		<u>Cost</u>
1939	1,788,000	\$	29,983.20
1938	1,762,000		30,677.20

20. WATER SUPPLY

The water supply from the 2nd Level pump was insufficient to meet the demand during several dry periods in the summer, so the auxiliary fire protection pump at the Morris Mine was run at intervals to make up the deficiency. In this way the concrete reservoir water level was maintained, and

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16. WATER SUPPLY (Cont.)

the water purified by extra chlorine dosages in the regular 2nd Level supply. Leakage at the base of the 50' diameter concrete reservoir due to frost action in the Spring was larger than normal, so in July a rich cement mixture was introduced to the inside through a 1 $\frac{1}{4}$ " pipe, and the quantity reduced below 10 gal. per minute.

The water main from the reservoir tank to the location is now situated between 2 undermined areas. The surface cave extension from east to west has approached to within 400' of the pipe due to the top slicing and stoping operations above the 5th Level. Mining was started in the 6th Level stopes in 1939 on the west side of the main, but the backs of these stopes are in hard jasper and caving is not expected for some time. The water pipe will have to be re-routed eventually however, and the rate of extension of the present cave will determine the time limit.

17. CONDITION OF PREMISES

The mine surface presents a better appearance each year as the healthy growth continues of the flowers, shrubbery and trees that were planted in 1937. The lawn on the slope in front of the main building, the roads and parking areas, and the modern steel buildings were all kept neat and in order to present a most attractive appearance particularly during the summer months.

The North Lake Location was maintained in good condition, but as noted before this requires an annual expenditure which seems out of line with income. Very little outside work was needed to maintain the fine appearance of the buildings which were painted in 1937. The continued 100% occupancy, and the long waiting list, stands as a tribute to their condition. One need that must be repeated however, is the installation of a sanitary sewer system, and it is hoped that the details in connection with this improvement may be worked out soon in the future.

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18. NATIONALITY OF  
EMPLOYEES

	<u>American</u> <u>Born</u>	<u>Foreign</u> <u>Born</u>	<u>Total</u>	<u>Per</u> <u>Cent</u>
Finnish	36	42	78	39
Italian	8	30	38	19
French	33	2	35	17
English	16	6	22	11
Swedish	14	5	19	9
Norwegian	4	1	5	2
Austrian	1		1	1
German	1		1	1
Belgian	1		1	1
	<u>114</u>	<u>86</u>	<u>200</u>	<u>100%</u>

This nationality classification compares very closely with that of last year.

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1. GENERAL

Production was stepped up about 15% above 1938 but the total was quite a little less than 1936 and 1937. The mine was kept on a 4-day-a-week schedule until September 17, 1939, when operations were boosted to five days per week. The product per day dropped off lower and lower as the water problem increased.

The biggest change underground was the increase in the amount of water coming into the underground workings. Every month showed an increase like a geometrical progression, the early months showing only 15 gallon increases, which by the middle of the year had reached 75 gallons, finishing up with a jump of 160 gallons per minute in December. The peak of 1232 gallons per day was reached the second week in December. By the end of December the gallons per minute had dropped to 1180. It might be noted here that deep well pump No. 3 started operating on Dec. 3rd but there was one interruption of four days from Dec. 9th to Dec. 13th. Deep well pump No. 4 did not start pumping until Jan. 1, 1940. Pump No. 3 is located about one-quarter of a mile Southwest of the Southwest corner of the Main Deposit on the 8th level and because that pump is so far away from the probable footwall dike contact at ledge there does not seem to be reason for believing that the new deep well pump caused the slackening off of the underground water flowage.

A cave on the surface on the night of March 12th over the top of the old 3rd level shrinkage stope Southwest of the Shaft was the first experience of this nature at the Morris Mine. The probability of this happening had been forecast over two years previously by the increase in the water flowing into the mine. This is very evident from the table shown under the caption "Underground" in this report.

The high sulphur ore, over which much concern was evident in 1938, did not prove to be much of a problem and only 312 tons was produced all told.

The ore estimate shows a decrease of about 285,000 tons.

2. PRODUCTION, SHIPMENTS & INVENTORIES

a. Production

	<u>Grade</u>	<u>Tons</u>
Morris Standard		227,525
" Siliceous		49,905
" High-Sulphur		312
Total		<u>277,742</u>

The division between fee and leased lands was as follows:

	<u>Leased Lands</u>	<u>Fee Lands</u>	<u>Total Tons</u>
Morris Standard	158,704	68,821	227,525
" Siliceous	38,349	11,556	49,905
" High-Sulphur	312	-	312
Total	<u>197,365</u>	<u>80,377</u>	<u>277,742</u>
	71.1%	28.9%	100.00%

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The tonnage and percentage of product from the leased and fee portions of the mine since 1932 follow:

Year	Leased Lands		Fee Lands	
	Tons	% of Total	Tons	% of Total
1939	197,365	71.1	80,377	28.9
1938	169,220	70.4	71,104	29.6
1937	261,468	61.4	164,490	38.6
1936	180,647	51.9	166,752	48.1
1935	187,679	76.5	57,781	23.5
1934	129,284	74.6	43,985	25.4
1933	103,487	82.0	22,709	18.0
Grand Total	1,229,150	66.9	607,198	33.1

The ore hoisted from the mine as to grade is shown below divided between Standard and Siliceous and High-Sulphur ore. The latter, however, was of such small volume in 1939 that the Inland management made a transfer and only show two grades produced in 1939. The High-Sulphur ore was transferred to the Standard grade.

Year	Standard Ore		Siliceous Ore	
	Tons	% of Total	Tons	% of Total
1939	227,837	82.0	49,905	18.0
1938	198,353	82.5	42,041	17.5
1937	316,353	74.4	109,605	25.6
1936	289,421	83.4	57,978	16.6
1935	202,296	82.5	43,164	17.5
1934	125,634	72.8	47,635	27.2
1933	105,441	83.6	20,755	16.4
Total	1,465,265	79.79	371,083	20.21

It will be noted that about the same percentage of high grade and siliceous ores were hoisted the past two years. The seven-year average is pretty close to 80 and 20%.

b. Shipments

Ore shipped from stockpile and pockets for 1939 was as follows:

Grade	Pocket	Stockpile	Total
	Tons	Tons	Tons
Morris Standard	145,830	187,157	332,987
" Siliceous	38,113	19,143	57,256
Total	183,943	206,300	390,243

Shipments for the past seven years follow:

Year	Standard Ore	Siliceous Ore	Total Ore
1939	332,987 tons	57,256 tons	390,243 tons
1938	199,457 "	40,462 "	239,919 "
1937	250,468 "	88,578 "	339,046 "
1936	236,512 "	64,373 "	300,885 "
1935	181,233 "	36,624 "	217,857 "
1934	110,956 "	45,565 "	156,521 "
1933	63,255 "	13,300 "	76,555 "
Total	1,374,868 "	346,158 "	1,721,026 "

Shipments from the mine exceeded any previous year.

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c. Ore in Stock

Stockpile balances at the end of the year totalled:

Morris Standard Ore	93,482 Tons *
" Siliceous Ore	21,796 "
Total	115,278 "

\* Includes 312 tons of High-Sulphur Ore.

Stockpile balances for previous years follow:

Stockpile balances as of Dec. 31, 1939	-	115,279	Tons
" " " "	-	227,779	"
" " " "	-	227,374	"
" " " "	-	140,459	"
" " " "	-	93,993	"
" " " "	-	66,389	"
" " " "	-	49,641	"

e. Production by Months

<u>Month</u>	<u>Shifts Operated</u>	<u>Morris Standard</u>	<u>Morris Siliceous</u>	<u>High Sulphur</u>	<u>Total Production</u>
January	18	20,772	1,821		22,593
February	16	17,640	2,250		19,890
March	18	18,735	2,699		21,434
April	16	19,148	3,673		22,821
May	18 $\frac{1}{2}$	20,344	5,434		25,778
June	17 $\frac{1}{2}$	17,928	5,603	183	23,714
July	17	16,051	5,146	129	21,326
August	19	19,898	3,674		23,572
September	18	15,878	5,334		21,212
October	22	22,126	5,285		27,411
November	23	20,680	5,714		26,394
December	20 $\frac{1}{2}$	18,325	3,272		21,597
Total	223 $\frac{1}{2}$	227,525	49,905	312	277,742

The average daily product by months and tons per man per day follows. The latter figure, however, is conjecture.

<u>Month</u>	<u>Average Daily Product</u>	<u>Total Tons Per Man Per Day</u>	<u>No. of Men Employed</u>
January	1,255	6.27	200
February	1,243	6.16	202
March	1,191	5.87	203
April	1,427	7.03	205
May	1,394	6.76	206
June	1,355	6.49	208
July	1,254	6.12	205
August	1,240	6.02	206
September	1,178	5.67	208
October	1,246	6.35	196
November	1,147	6.02	190
December	1,054	5.60	188
Yearly Average	1,243	6.19	201

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For comparison we show data for 1938 and 1939:

<u>Year</u>	<u>Average Daily Product</u>	<u>Tons Per Man Per Day</u>	<u>Number of Men Employed</u>
1939	1,243	6.19	200
1938	1,204	5.75	206

f. Delays

The most serious delay for the year occurred on Monday, Tuesday, and Wednesday in March following the cave-in of Sunday night. In order to protect both the Morris and Lloyd Mines, crews were sent underground to close all the dams and no mining was done until it was certain that no serious immediate consequences would result from the cave.

3. ANALYSIS

Following are the detailed and composite results on shipments of Morris Standard Ore:

<u>Month</u>	<u>Tons</u>	<u>Iron Dried</u>	<u>Moisture</u>	<u>Iron Natural</u>
April	20,397	58.07	10.68	51.97
May	18,743	58.63	10.14	52.68
June	18,128	59.09	10.46	52.91
July	55,340	57.73	10.42	51.72
August	62,859	58.01	10.56	51.88
September	60,410	57.47	10.49	51.44
October	48,917	58.32	10.58	52.15
November	46,580	57.58	10.47	51.55
December	1,612	59.28	10.70	52.95

Average Analysis of Morris Standard shipments for 1939 were:

Iron Dried	-	57.97
Iron Natural	-	51.90
Phos.	-	.046
Silica	-	9.61
Moisture	-	10.48

The average for the Silica ore shipments follows:

<u>Month</u>	<u>Tons</u>	<u>Iron Dried</u>	<u>Moisture</u>	<u>Iron Natural</u>
April	3,673	49.55	10.30	44.45
May	4,934	50.40	8.90	45.91
June	5,554	51.57	9.14	46.85
July	5,596	51.90	10.25	46.58
August	9,920	49.29	9.66	44.53
September	7,216	52.45	10.42	46.98
October	13,480	52.24	9.83	47.11
November	5,571	53.04	9.85	47.82
December	1,311	51.81	10.20	46.53

Average Analysis of all Silica shipments were:

Iron Dried	-	51.35
Iron Natural	-	46.32
Phos.	-	.043
Silica	-	17.89
Moisture	-	9.80

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The accumulated analysis of the ores as stocked follow:

<u>Month</u>	<u>Morris Standard</u>			
	<u>Tons</u>	<u>Iron Dried</u>	<u>Phos.</u>	<u>Moisture</u>
January	219,404	58.43	.059	10.27
February	237,044	58.43	.059	10.27
March	255,779	58.50	.060	10.27
April	254,530	58.50	.060	10.27
May	256,130	58.50	.060	10.27
June	255,930	58.50	.060	10.27
July	216,641	58.50	.060	10.27
August	173,680	58.50	.060	10.27
September	129,148	58.50	.060	10.27
October	102,358	58.50	.060	10.27
November	76,458	57.80	.054	10.30
December	93,483	57.84	.054	10.30
Natural Average		51.88	.048	10.30

Natural Average Analysis of ore in stock follows:

<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Moisture</u>
51.88	.048	9.47	.40	1.95	10.30

<u>Month</u>	<u>Morris Siliceous</u>			
	<u>Tons</u>	<u>Iron Dried</u>	<u>Phos.</u>	<u>Moisture</u>
January	30,968	51.38	.052	9.71
February	33,218	51.38	.052	9.71
March	35,917	51.29	.051	9.71
April	35,917	51.29	.051	9.71
May	36,418	51.29	.051	9.71
June	36,467	51.29	.051	9.71
July	36,017	51.29	.051	9.71
August	29,771	51.29	.051	9.71
September	27,888	51.29	.051	9.71
October	19,692	51.29	.051	9.71
November	19,835	51.27	.048	9.70
December	21,796	51.46	.048	10.00
Natural Average		46.31	.043	10.00

Natural Average Analysis of ore in stock follows:

<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Moisture</u>
46.31	.043	17.71	.32	2.27	10.00

<u>Month</u>	<u>High-Sulphur Ore</u>				
	<u>Tons</u>	<u>Iron Dried</u>	<u>Phos.</u>	<u>Moisture</u>	<u>Sulphur</u>
June	183	59.29	.052	10.27	.031
July	312	59.29	.052	10.27	.031
August	312	59.29	.052	10.27	.031
September	312	59.29	.052	10.27	.031
October	312	59.29	.052	10.27	.031
November	312	59.29	.052	10.27	.031

Note

This tonnage transferred and included in the Morris Standard grade.

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Analysis of Ore Reserves

Note: All Natural Analysis

<u>Grade</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss</u>	<u>Moist</u>
Morris Standard	52.35	.060	8.80	.45	2.29	.73	.26	.012	2.57	10.48
" High Sulph	52.75	.106	7.20	.39	2.28			.458		10.27

Analysis of Ore in Stockpile

Note: All Natural Analysis

<u>Grade</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum</u>	<u>Moist.</u>
Morris Standard	51.88	.048	9.47	.40	1.95	10.30
" Siliceous	46.31	.043	17.71	.32	2.27	10.00

Analysis of Ore Shipments

Note: All Natural Analysis

<u>Grade</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss</u>	<u>Moist</u>
Morris Standard	51.90	.046	9.61	.39	2.02	.87	.38	.013	1.70	10.48
" Siliceous	46.32	.043	17.87	.33	2.28					9.80

4. ESTIMATE OF  
ORE RESERVES

	<u>Ore Reserves as</u> <u>of Dec. 31, 1939</u>	<u>Ore Reserves as</u> <u>of Dec. 31, 1938</u>	<u>Difference</u>
C. C. I. Co. Lands	372,999 Tons	532,847 Tons	- 159,848 Tons
Chase Lease #9	1,412,302 "	1,514,949 "	- 102,647 "
" " #24	131,818 "	142,183 "	- 10,365 "
" " #25	33,273 "	33,273 "	None
" " #26	26,140 "	26,140 "	None
Total	1,976,532 "	2,249,392 "	- 272,860 "
<u>High Sulphur Ore</u>			
Chase Lease #9	2,208 "	13,893 "	- 11,685 "
" " #24	55,079 "	55,147 "	- 68 "
Grand Total Ore Reserves	2,033,819 "	2,318,432 "	- 284,613 "
1939 Production of Standard Ore	227,837 "		
1938 Estimate	2,261,656 "		
Net Loss for 1939	2,318,432 "		
	56,776 "		

Detail of Ore EstimateC. C. I. Co's LandsOre Above 7th Level

No. 21 Deposit

23,270 Tons

Ore Above 8th Level

No. 21 Deposit

8,427 "

" 33 or Main Deposit

218,856 "

" 76 or "C" Deposit

8,100 "

Total

235,383 "

Ore Below 8th Level

No. 33 or Main Deposit

105,909 "

" 76 or "C" Deposit

8,437 "

Total

114,346 "

Grand Total C. C. I. Co. Lands

372,999 "

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<u>Chase Lease #9</u>		
<u>Ore Above 7th Level</u>		
	No. 21 Deposit	3,310 Tons
	" 61 "	15,656 "
	" 75 "	14,775 "
	" 78 "	<u>5,250 "</u>
	Total	38,991 "
 <u>Ore Above 8th Level</u>		
	No. 33 Deposit	539,410 "
	" 61 "	15,054 "
	" 75 "	282,039 "
	" 76 "	31,965 "
	" 77 "	84,270 "
	" 78 "	<u>8,672 "</u>
	Total	961,410 "
 <u>Ore Below 8th Level</u>		
	No. 33 Deposit	317,639 "
	" 75 "	60,325 "
	" 76 "	<u>33,937 "</u>
	Total	411,901 "
	Total Chase Lease #9 (Standard Ore)	1,412,302 "
	" " " #9 (High Sulphur)	<u>2,208 "</u>
	 GRAND TOTAL CHASE LEASE #9	 1,414,510 "
 <u>Chase Lease #24</u>		
<u>Ore Above 8th Level</u>		
	No. 33 Deposit	22,585 "
	" 79 "	<u>7,582 "</u>
	Total	30,167 "
 <u>Ore Below 8th Level</u>		
	No. 33 Deposit	49,871 "
	" 79 "	<u>15,375 "</u>
	Total	65,246 "
	Carried forward from 1937 Estimate	<u>36,405 "</u>
	Total	131,818 "
	High Sulphur Ore in #79 Deposit	<u>55,079 "</u>
	 GRAND TOTAL CHASE LEASE #24	 186,897 "
 <u>Chase Lease #25</u>		
	Ore Above 7th Level	22,937 "
	" " 8th "	<u>10,336 "</u>
	Total Chase Lease #25	33,273 "
 <u>Chase Lease #26</u>		
	Ore Above 7th Level	9,687 "
	" " 8th "	<u>16,453 "</u>
	Total Chase Lease #26	26,140 "

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6. SURFACE

Deep Wells & Pumps

At the beginning of 1939 there were two deep well pumps operating but on January 1940 there were four in commission, the fourth one starting up on New Year's Day 1940.

Ten test holes were drilled prior to 1939 and during the past year seven more were added. All of the old holes without exception show a lowering of the water level in the quicksand on top the ledge. In some of the new holes the water level appears to have risen but that is due to the difference in the height of the water level immediately following the finishing of a well by the drilling contractor and readings taken a week or two later. Invariably it has been found that while work is in progress drilling a well, the water level is lower than it is when work ceases.

The following table shows how the water has gone down each year and the total drop for each hole.

Test Hole	Distance from			Drop in Water Level				Depth Remaining to ledge
	#1	#2	#3	1937	1938	1939	Total	
	Well	Well	Well					
#501	1770'	1480'	2900'	3' 6"	6' 8"	5' 4"	15' 6"	77' 10"
502	950'	1060'	2175'	1' 5"	5' 4"	35' 2"	41' 11"	92' 11"
503	500'	1225'	1675'	15' 8"	7' 7"	3' 1"	26' 4"	172' 10"
504	550'	860'	725'	16' 0"	13' 1"	4' 0"	33' 1"	115' 6"
505	780'	100'	1510'	6' 4"	7' 6"	5' 2"	19' 0"	110' 5"
506	1430'	740'	2225'	3' 4"	5' 11"	8' 0"	17' 3"	69' 8"
507	730'	570'	1800'	5' 0"	8' 2"	16' 8"	29' 10"	106' 6"
508	940'	1380'	2175'	1' 3"	0' 0"	40' 10"	42' 1"	91' 4"
509	25'	880'	1260'	27' 5"	5' 7"	5' 7"	38' 7"	147' 9"
510	1210'	800'	950'	0' 0"	1' 1"	6' 1"	7' 2"	114' 4"
511	1220'	1170'	475'			-7' 6"	-7' 6"	159' 10"
512	1220'	1480'	30'			7' 8"	7' 8"	149' 0"
513	2475'	2409'	1300'			1' 0"	1' 0"	163' 7"
514	1000'	1540'	500'			-2' 4"	-2' 4"	124' 2"
515	1200'	2050'	2060'			-4' 6"	-4' 6"	127' 0"
516	3135'	2970'	1975'			5' 6"	5' 6"	35' 0"
517	1210'	1923'	2275'			-4' 4"	-4' 4"	114' 7"

During the latter part of May and June and the early part of July, because of heavy rains, most of the holes showed a rise in water level and it really wasn't until August that the deep well pumps got the best of the situation and water levels started dropping again. Two holes, #502 and #508, show a big drop for 1939. That is due to the cave occurring in March. #502 is in the caved area and #508 lies 450 ft. to the Northwest of the cave. The water in the overburden around #508 is undoubtedly finding its way down to the 6th and 7th levels because this hole shows a greater drop than any other and the overburden is dry for a distance of 10 ft. below the bottom of the new cave.

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The following figures give one an idea of how the pumping rate has varied but gone down steadily in the wells as the water level is being lowered:

<u>Month</u>	<u>Pump #1</u> <u>G.P.M.</u>	<u>Pump #2</u> <u>G.P.M.</u>	<u>Pump #3</u> <u>G.P.M.</u>	<u>Pump in Cave</u> <u>G.P.M.</u>
January	1420	585		
February	1410	615		
March	1380	570		
April	1345	545		60
May	1340	535		95
June	1320	540		95
July	1290	545		95
August	1225	535		75
September	1205	510		60
October	1140	480		55
November	1085	450		40
December	1000	430	1125	20

Pump #1 shut down from Jan. 21st to Feb. 11th for repairs  
 Pump in cave shut down Dec. 15th because of freezing weather  
 Pump #3 started Dec. 3rd. Shut down Dec. 9th but started again on Dec. 13th.  
 Pump #4 started on Jan. 1st, 1940.

Cave

On Sunday evening the first surface cave at the property occurred. We were aware of something unusual happening because all electric power was cut off at the same moment. The main electric power line serving the area West of the Morris Mine was located right over the area caved and several poles went down into the cave short circuiting the power lines.

The cave occurred over the back of the old 3rd and 4th level shrinkage stopes. Dams were immediately closed on all levels in both the Morris and Lloyd Mines and no mining done on either Monday or Tuesday. Operations were resumed on Wednesday. There was no real noticeable increase in water flowage underground for a month following the cave-in.

7. UNDERGROUND

Water Situation

This is put ahead of all other underground topics because the constantly increasing water was a worry for all concerned in the North Lake District. The following tabulation gives the picture for the past six years:

<u>Month</u>	<u>Gallons per Minute</u>					
	<u>1939</u>	<u>1938</u>	<u>1937</u>	<u>1936</u>	<u>1935</u>	<u>1934</u>
January	570.5	538	233	225	130	124
February	589.8	540	255	201	130	142
March	600.5	612	270	202	134	120
April	615.4	641	294	204	133	126
May	660.7	596	328	202	181	127
June	683.3	562	393	202	169	117
July	762.4	569	406	206	161	123
August	799.5	563	432	207	163	118
September	907.4	557	405	203	172	118
October	978.8	555	382	210	172	123
November	1062.7	536	466	233	187	113
December	1222.2	548	458	201	163	81
Average	788	568	360	208	158	119

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The foregoing clearly shows what has been going on. The peak occurred the second week in December and since then there has been a marked decrease on the 7th and 8th levels.

Total gallons per minute	first week of December	1222
"	second " "	1232
"	third " "	1202
"	fourth " "	1180

On the 15th of January 1940 the flow had increased again to 1204 gallons per minute.

It might be well to repeat here what was said under General Remarks in the beginning of this report and that is that the water slackened up underground shortly after the starting up of deep well pump #3 on Dec. 3rd located 1250 ft. Southwest of pump #1. This #3 pump is 200 ft. South of the old Barnes-Hecker Mine drainage ditch which was located far enough South of the ore bodies to prevent any water from the ditch getting back into the mine. We cannot imagine any real connection between the pumping in #3 well and the water seeping into the mine, but would expect a decrease when #4 well drains the area tributary to it if there are cracks leading up to surface along the main dike on the South side of the Main Deposit.

The water situation month by month on the various levels is best evident by examining the following table:

<u>Month</u>	<u>4th Level</u>	<u>6th Level</u>	<u>7th Level</u>	<u>8th Level</u>	<u>Total</u>
January	11.5	56.7	147.8	354.5	570.5
February	10.8	61.7	164.7	352.6	589.8
March	11.9	67.7	163.3	357.6	600.5
April	13.3	61.6	180.5	360.0	615.4
May	13.2	64.4	200.3	382.8	660.7
June	13.1	77.5	218.6	374.1	683.3
July	12.8	92.9	263.3	393.4	762.4
August	12.0	85.9	317.3	384.3	799.5
September	11.5	84.7	365.8	445.4	907.4
October	12.9	97.5	388.6	479.8	978.8
November	14.4	121.4	423.1	503.8	1062.7
December	15.3	132.0	556.2	518.5	1222.0
January 15, 1940	15.0	120.1	605.0	464.0	1204.1

On Jan. 1st, 1940, the flow on the 7th level was 670 gallons per minute and on the 8th level 537 gallons per minute.

In order to protect the mine following the cave-in, the Inland Company was prevailed upon to build two new concrete plugs on the 6th level in the rock crosscuts leading to the old #24 sub stope which ran from the 6th level up to within 150 ft. of the 4th level. These plugs have pipes in them for draining out any water that might accumulate behind the dams.

Furthermore, several attempts were made to push pipes through the openings in the 3rd and 4th level concrete plugs or dams but no water was found dammed up in the drifts close to the dams. Late in the year it was planned to drill a diamond drill hole or two on the 4th level from the end of a short drift West to the end of the drift under the old shrinkage stope in order to drain out the water that more than likely was trapped in the drift.

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Developing

Development work was practically concentrated mostly in two areas - the new #77 Deposit in the West Central part of Chase Lease #9, and the new 9th level, although some new work was done on the -40 ft. sub level and the 8th level.

In what is now known as #77 Deposit located Southwest of old #75 Deposit, #14 contract after raising up from the 8th level for approximately 100 ft. ran into some high grade low sulphur ore. The purpose of this raise was to find out how far below the -10 ft. sub the high-sulphur ore went. The new ore area was found to extend East and West for 280 ft. with a width of 60 ft., adding 85,000 tons to the ore estimate. This ore is in the Southwest corner of Chase Lease #9.

On the -40 ft. sub level Contract #8 drifted South along the 2100 West coordinate line on our fee lands to the South of the South boundary and then crosscut East and West in a narrow lens of ore about 175 ft. long.

Over on the East side of the mine a new raise was put up from the 8th level to divide up #13's territory and a new sub was started at the -40 ft. elevation.

On the 8th level three new projects were started. Over on the West side the middle East-West crosscut was driven West for 220 ft. and exploring drifts put in North and South, but the formation was lean. All of the drifts and crosscuts were in siliceous ore. However, a raise put up from the new drift close to the 2400 West coordinate line found the new #77 deposit as previously described over in the Southwest corner of the main level. A new crosscut driven South along the 1400 West coordinate line provided a means for putting up a new raise to cut up #13's territory so that two gangs could be employed. A new raise was also put up on the 1600 West line in the central part of #33 deposit.

9th Level

The most important development project, of course, was the new 9th level. The main rock drift was driven all the way across our fee lands over onto Chase Lease #9, a distance of 900 ft. A crosscut was also started South along the 1400 West coordinate line and when this hit iron formation together with the water that always follows the opening up of a new level, work was stopped pending the installation of new pumps. Two pumphouses were excavated, the sump finished, and two crosscuts inclining down to the pump suction sump finished. These crosscuts are 400 ft. long and are intended to act as sumps for storing water. Their storage capacity is calculated to be 230,000 gallons.

Hitches were cut for a new concrete dam, equipped with stop logs, 400 ft. South of the pumphouses.

Although no pumps have been ordered it is now planned to buy a 1,000 g.p.m. Triplex horizontal Prescott pump built for 2,000 ft. head so that the water can be pumped direct to surface and not relay it with the 4th level pumps.

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Stoping

Most of the ore mined in 1939 was taken out by the slicing method, there being but little opportunity to sub level stope any large tonnage.

210' Sub Level

In this deposit above the 7th level over on our fee lands to the East of Chase Lease #9, mining was finished on the 210, 200, 190, 180, and most of the 170 ft. sub. By the end of the year #1 Contract was slicing on the 160 ft. sub level. There is still one pillar left to be mined on the 170 ft. sub level.

150' Sub Level

In #75 Deposit down in the South Central portion of Chase Lease #9 a triangular shaped area about 150 ft. long was sliced from the 150 ft. down to the 110 ft. elevation.

140' Sub Level

Early in the year Contracts #6 and #7 sliced in the central and Eastern portion of #61 Deposit on Chase Lease #9. The area became increasingly wetter as the months went by and there is no doubt but what water from surface was coming down through the back of #6's and #7's workings. Late in the year one of these gangs was taken out of this area because the subs were getting too close to the main level and the main 7th level drift could not be kept from crushing.

120' Sub Level

Contract #23 worked out three subs - the 120, the 110, and the 100 ft. subs - in the extreme East end of #75 deposit. The West end of the subs was too lean to mine.

70' Sub Level

The main portion of #75 deposit was divided up into four separate areas and given to four separate contracts and these gangs took out two subs above the 7th - the old 7th level sill floor and one sub below the 7th level. With the exception of the extreme West end this ore was all sliced.

In the Main Deposit East of Chase Lease #9 Contract #13 continued to slice on the 70, 60, and 50 ft. sub levels. This area is the triangular shaped offshoot of the Main Deposit South of the main dike.

50' Sub Level

Up in the Northeast corner of the Main or #33 Deposit, #2 on our side of the boundary, and #3 on Chase Lease #9, sliced out between the hanging and the dike the 60, the 50, and part of the 40 ft. sub levels.

20' Sub Level

The Northwest limb of #75 Deposit was stoped from the 7th level down to the 20 ft. elevation, a distance of 90 ft. Late in the year stoping had to be stopped because of trouble with the dike sluffing off from the South side.

000' Sub Level

Down the South Central part of the Main Deposit along the South boundary line, most of the ore between 2000 and 2200 West was mined from the 000 sub down to the -20 ft. elevation.

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-40' Sub Level

Down in the Southwest corner of Chase Lease #9, the Main Deposit is split by a dike that runs along on the South boundary of Chase Lease #9. Ore is mined on Chase Lease #9 North of the dike and on our fee lands to the South of the dike. North of the dike a pillar of ore was taken out by the slicing method from the -30 ft. sub to the -50 ft. sub level between coordinates 2150 and 2300 West. South of the dike a pillar was removed from between the old sub stops near the 2500 West coordinate line from the -20 to the -90 ft. subs. Over near the 2200 West coordinate line in Contract #26's territory South of the foregoing mentioned dike, three subs were sliced - the -60, -50, and -40 ft. subs.

-90' Sub Level

There was a lot of activity on this sub with four gangs employed, #11, #15, #21, and #24, all in #33 Deposit. They mined under three separate parcels - Lease #9, Lease #24, and The C. C. I. Co. lands. Furthermore, all the ore was sliced because this was the first sub underneath the large stopes up over and every effort had to be made to slice, lag down, and thoroughly cover the floors with wire and old timber to provide a mat for the subs below. By the end of the year the -90 ft. sub was completely mined and #24 had dropped to the -100 ft. sub on the North side of the dike on Chase Lease #9.

-110' Sub Level

South of the dike that parallels the boundary between the Chase leases and The C. C. I. Co. lands, two contracts - #11 and #15 - after finishing the subs up above, started slicing on this sub level. Over on Chase Lease #24 Contract #21 had finished three parallel slices by Dec. 31st, 1939, running West from the boundary.

High-Sulphur Mining

On the -10 ft. sub #9 in the Northwest corner of #75 Deposit did not find as much high-sulphur ore as was supposed to be there a year ago. In fact, only 312 tons were hoisted during the entire year. All the slices on the North side of the main scraping drift ran into Standard Morris grade ore. We have already stated that the ore lower down in #77 Deposit is all high-grade ore so that in this portion of the mine there is not much ore high in sulphur.

Drifting & Raising

A comparison of the drifting and raising done in ore - both siliceous and standard grade - for the three years follows:

	<u>1937</u>	<u>1938</u>	<u>1939</u>
Small 6' x 6' drifts & raises (mostly Silica)	1468'	1500'	155'
Large 8' x 12' Raises	185'	110'	90'
Large 10' x 10' Drifts	390'	105'	220'
Small 6' x 6' drifts & Raises (Standard Ore)	60'	495'	815'
Large 8' x 12' Raises	55'	0'	150'
Large 10' x 10' Drifts	0'	180'	30'

In addition to the development work done in ore, the 9th level development work totalled 1425 ft. in slate rock.

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Number of Contracts Employed

The year started off with 20 gangs on contract and the company account miners on the 9th level. The year finished with 21 gangs plus the miners on the 9th level.

As mentioned before, most of the ore was sliced and the following table shows how the contracts were employed during the year:

	<u>Total</u>
Sub Level Slicing Gangs - #1, 2, 3, 4, 6, 7, 8, 10, 13, 20, 21, 23, 24, 25, 26,	15 Gangs
Stoping Gangs - #9, 11	2 "
Drifting and Raising - #14, 15, 22, 27	4 "
	21 "

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1. GENERAL

Loading at the Tilden Mine was started on May 1st, a little more than a month earlier than the previous year. Operations were intermittent throughout the season and for the most part on a single shift basis with one shovel in the East Pit, one in the West Pit Upper Bench and the third in the West Pit Lower Bench. Production was 170,276 tons as compared with 85,589 in 1938, an increase of 84,687. Production and shipments were completed on November 18th and winter repairs to plant and equipment were started immediately. The following tonnages were produced in the various pits:  $W\frac{1}{2}$  of West Pit - 35,623;  $E\frac{1}{2}$  of West Pit 26,825; Lower Bench West Pit - 38,269; Total West Pit - 100,717; East Pit - 69,559; Grand Total - 170,276. Approximately 27,000 tons of the above were shipped as Tilden Low Phosphorus Ore and the remainder as Tilden Silica.

Churn drilling was carried on intermittently throughout the season as required, the bulk of the work being done with the 9" machines, the 6" machines being used only in the sinking out of the Lower Bench. There was no churn drilling contemplated for the winter months since the broken ore reserves in the several pits are ample for early season loading next year.

A considerable amount of stripping was done in the East Pit, the  $W\frac{1}{2}$  of the West and the Lower Bench by Company men and equipment.

Four primary blasts were shot during the season, one in the East Pit, one in the  $W\frac{1}{2}$  of the West and two in the sinking out of the Lower Bench. Work in the sinking out of the Lower Bench was started at the beginning of the loading season and continued throughout the operating shifts. All of the ore produced in this area was transported to the crusher by the new D-8 Caterpillar tractor and Athey crawler-wagon, which were purchased early in May.

2. PRODUCTION  
SHIPMENTS &  
INVENTORIES

a. Production by Grades

	<u>Tilden Silica</u>	<u>Tilden Silica #1.</u>	<u>Low Phosphorus</u>	<u>Total</u>
West Pit	100,717	-	-	100,717
East Pit	40,284	2,272	27,003	69,559
Summit Pit	-	-	-	-
Total	141,001	2,272	27,003	170,276

The production shown for Tilden Silica #1 of 2,272 tons was the ore produced from the East Pit during the loading of Low Phosphorus cargoes. The cars which analyzed too high in Phosphorus were held as Tilden Silica #1 and mixed with and shipped as Tilden Silica.

b. Shipments

Shipments from this property for 1939 were the same as the production figures of 170,276 tons.

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2. PRODUCTION  
SHIPMENTS &  
INVENTORIES (CONF.)

c. Stockpile Inventories

There is no ore stocked at the Tilden Mine. The following are the book figures of the broken ore reserves in the several pits:-

East Pit - - - - -	97,949 Tons.
Lower Bench, West Pit - - - -	1,961 "
W $\frac{1}{2}$ of West Pit - - - - -	86,952 "
E $\frac{1}{2}$ of West Pit - - - - -	0 "
Summit Pit - - - - -	7,032 "
Total - - - - -	193,894 Tons.

The above book figures compare with 39,386 tons at the end of 1938, an increase of 154,508 tons.

The book figures of broken ore reserves are quite accurate since the accumulations of overrun were for the most part cleaned up during the year. 53,784 tons of overrun were loaded during 1939, of which 41,400 were from the West Pit, 7,230 tons from the Lower Bench and 5,154 from the East Pit. Previously, 60,514 tons were loaded from the West Pit. Totals to date are:

West Pit - - - - -	101,714 Tons
East Pit - - - - -	5,154 "
Lower Bench - - - - -	7,230 "
Grand Total to Date	114,098 Tons.

e. Product by Months

<u>Month</u>	<u>Days Operated</u>	<u>Average Tonnage Per 8 Hr. Shift</u>	<u>Total Tons.</u>
May	10 (1-8 Hr.)	1,738	17,383
June	16 (1-8 Hr.)	1,715	27,484
July	7 (1-8 Hr.)	2,592	18,145
August	11 (1-8 Hr.) 1 (2-8 Hr.)	2,128	27,663
September	13 (1-8 Hr.)	2,253	29,300
October	11 (1-8 Hr.) 3 (2-8 Hr.)	1,640	27,893
November	10 (1-8 Hr.)	2,240	22,408
Total	86 (1-8 Hr.)	1,980	170,276

The average output per 8 Hr. shift of 1,980 tons during 1939, compares with 2,140 tons in 1938 and 1,996 tons in 1937. This decrease is due entirely to the fact that during 27 of the 86 operating shifts, work was carried on with one shovel only instead of the usual three. The actual average product per 8 hour day with three shovels is 2,505 tons.

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2. PRODUCTION  
SHIPMENTS &  
INVENTORIES (CONT.)

f. Ore Statement

	<u>1939 Tons</u>	<u>1938 Tons</u>
On hand January 1, 1939 - - - - -	-	-
Output for year - - - - -	<u>170,276</u>	<u>85,589</u>
Total - - - - -	<u>170,276</u>	<u>85,589</u>
Shipments - - - - -	<u>170,276</u>	<u>85,589</u>
Balance on Hand - - - - -	-	-
Increase in Output - - - - -	84,687	
Increase in Shipments - - - - -	84,687	

1936 - 77 - 1-8 hr. shifts and 57 - 2-8 hr. shifts, Total 191 - 1-8 hr. shifts.  
 1937 - 113 - 1-8 hr. shifts and 20 - 2-8 hr. shifts, Total 153 - 1-8 hr. shifts.  
 1938 - 40 - 1-8 hr. shifts and 0 - 2-8 hr. shifts, Total 40 - 1-8 hr. shifts.  
 1939 - 78 - 1-8 hr. shifts and 4 - 2-8 hr. shifts, Total 86 - 1-8 hr. shifts.

g. Delays

There were two rather extensive delays during the year, one caused by the breakdown of the boom and dipper of No. 31 electric shovel and the other caused by the breakdown of the main frame of the West 10" gyratory crusher. This second breakdown caused an actual delay of only two hours for the remainder of the shift, but made it necessary to keep the plant idle for several days thereafter while another frame was being installed.

The total lost time chargeable to the different pieces of equipment are listed below:

Power Shovels

<u>No. 29</u>	<u>No. 31</u>	<u>No. 46</u>	<u>Total</u>
3-1/4	9-1/2	5-3/4	18-1/2 hours.

This total of 18½ hours lost time compares with 50½ in 1938 and 114½ in 1937.

Other miscellaneous delays are listed below:

<u>Crushing Plant</u>	<u>Lack of Electric Power</u>	<u>Transportation Equipment.</u>	<u>Total Miscellaneous</u>
5-3/4	1-3/4	4-1/2	12 hours.

The estimated loss of product due to the above delays is as follows:

Shovels - - - - -	2,812 Tons.
Miscellaneous - - - - -	<u>3,928 "</u>
Total - - - - -	<u>6,740 Tons.</u>

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2. PRODUCTION  
SHIPMENTS &  
INVENTORIES (CONT.)

h. Delays from Lack of Current

There have been no operating delays as such due to lack of electric power since the installation of the new sub-station and transformers at the property. The 1-3/4 hours lost time listed under this heading were due entirely to the necessity of closing down the plant temporarily on several occasions during severe electrical storms. This is done as a precaution to prevent the possibility of the circuit breaker throwing out while the gyratory crushers are under load.

3. ANALYSIS

a. Average Mine Analysis on Output

<u>Grade</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss on Ignition</u>	<u>Moisture</u>
Tilden Silica	39.12	.037	41.88	.09	.88	.27	.27	.009	.33	1.77
" Silica #1	36.74	.016	45.89	.10	.50	.20	.16	.009	.28	2.03
" Low Phos.)	36.93	.014	45.61							

b. Average Analysis on Straight Cargoes

<u>Grade</u>	<u>Mine</u>			<u>Lake Erie</u>	
	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Iron</u>	<u>Moist.</u>
Tilden Silica	39.12	.037	41.89	39.88	1.99
Tilden Low Phos.	36.93	.014	45.74	37.45	1.90

c. High Sulphur Ore

The high sulphur ore found in the West portion of the East end of the West Pit was successfully added to and mixed with the West Pit product throughout the loading season without materially increasing the average sulphur content.

As was mentioned in the report for 1938, there was another small area containing high sulphur ore in the West portion of the West Pit. This material which was blasted in September of the current month was also handled in small quantities without affecting the average for the property. The continued use of three shovels is necessary to successfully grade the shipments and still maintain production.

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4. ESTIMATE OF ORE  
RESERVES

a. Developed Ore

1. West Pit

The estimate of reserves in the West Pit which was reported in 1938 has been changed slightly to conform with information obtained by stripping operations during 1939. In the West Pit, ore reserves and stripped reserves are the same since conditions will not permit additional stripping in this area.

Assumption: 13 cu. ft. equal 1 ton.

Grade: Tilden Silica

West Portion of West Pit, Upper Bench - - - - -	203,365 Tons
Less 10% for Rock - - - - -	20,335 "
Balance - - - - -	<u>183,030 Tons</u>
Broken Ore Reserves - - - - -	87,325 "
Total $\frac{1}{2}$ of West Pit, Upper Bench - - - - -	<u>270,355 Tons</u>
$\frac{1}{2}$ of West Pit, Upper Bench - - - - -	<u>165,865 "</u>
Total Upper Bench - - - - -	436,220 Tons
Total Lower Bench (60' deep) - - - - -	<u>2,000,000 "</u>
Total Developed Ore, January 1st, 1940, West Pit - - - - -	<u>2,436,220 Tons</u>

2. East Pit including Summit Pit

Assumption: 14 cu. ft. equal 1 ton

10% deduction for rock

Tonnage above 1500' elevation (Track grade from Crushing Plant)

Total Ore in Sight, January 1st, 1939 - - - - -	5,219,224 Tons.
Ore Mined in 1939 - - - - -	<u>69,559 "</u>
Total Developed Ore, January 1st, 1940, East Pit - - - - -	<u>5,149,665 Tons.</u>

Of this total of 5,149,665 tons, approximately  $\frac{2}{5}$  is expected to grade above .015 Phos. and  $\frac{3}{5}$  below .015 Phos. These figures, based on 1930 diamond drill exploration, have so far not been proved by the small tonnage mined at the base of the hill. The tonnage explored covers so large an area that it will be years before much of it is actually developed by mining. Until such time as results prove otherwise, the available ore at the East Pit can conservatively be estimated as analyzing .026 in Phos. which by selective mining and grading, can be made to yield a product of which approximately 25% would run .015 Phos. or lower.

As discussed in the report for 1937, operations at Summit Pit have been abandoned as such, although it is probable that these reserves will ultimately be mined from the present floor of the East Pit.

3. Developed Ore as of January 1st, 1940:

West Pit - - - - -	2,436,220 Tons
East Pit (including Summit) - - - - -	<u>5,149,665 "</u>
Total Tilden Mine - - - - -	<u>7,585,885 Tons.</u>

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4. ESTIMATE OF ORE  
RESERVES (CONT.)

b. Prospective Ore

In addition to the developed ore, there is probably a considerable tonnage to the North and East of the area developed by drilling at the East and Summit Pits. The reserves in the West Pit are definitely limited by dikes, over-burden and lean material as explained in the letter regarding E. & A. #786 for stripping and opening the lower bench. Under present conditions, there is no further prospective ore in this portion of the property. The ultimate expansion of operations will probably be a continuation of the East Pit which will extend to the North and East, eventually including Summit Pit. The recovery of the ore in the lower bench of the West Pit which was started in 1939 will be accomplished by mining with the present floor of the West Pit as the top of the face and a plane 10' below the elevation of the L. S. & I. tracks as the new floor. The total height of face when fully developed will be approximately 60'.

c. Estimated Analysis of Reserves

1. <u>West Pit</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Ign.</u>	<u>Moist.</u>
Dried	39.25	.038	42.20	.09	.60	.28	.20	.013	.25	-
Natural	38.50	.037	41.40	.09	.59	.27	.20	.013	.25	1.90
2. <u>East Pit</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Ign.</u>	<u>Moist.</u>
Dried	37.00	.020	46.50	.120	.67	.48	.31	.014	.90	-
Natural	36.25	.020	45.40	.118	.65	.47	.30	.013	.88	2.50

The above analyses are the same as reported for 1937 and 1938. There is a possibility that the West Pit reserves will be slightly lower than the above due to contamination by dike. Further, the drilling records in the East Pit indicate a slightly higher iron content, at least for the next several seasons.

f. Estimate of Production

The following tables show the estimated productions and analyses that can be produced during the coming year. The first table shows the tonnages available by mining and shipping without selective loading from the East Pit. The 7,000 tons of broken ore in Summit Pit have been omitted from the tables, since it would be highly impractical to attempt to load this ore at the present time.

The figures in the second table are based on the assumption that any low Phos. ore desired will be produced by selective loading in the East Pit.

1. -

ESTIMATE OF 1940 PRODUCTION AS TO PITS

<u>Grade</u>	<u>Tonnage</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Sul.</u>	<u>Moist.</u>	<u>Iron</u> <u>Nat'l.</u>
Tilden Silica West Pit	350,000	39.12	.049	42.50	.014	1.90	38.38
Tilden Silica #1 East Pit	100,000	37.50	.020	46.00	.011	2.00	36.75
Total.....	450,000	38.80	.043	43.30	.011	1.92	38.03

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4. ESTIMATE OF ORE  
RESERVES (CONT.)

f. Estimate of Production (Cont.)

<u>ESTIMATE OF PRODUCTION BY GRADING EAST PIT ORE</u>							
<u>Grade</u>	<u>Tonnage</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Sul.</u>	<u>Moist.</u>	<u>Iron Nat'l.</u>
Tilden Silica (Includes West Pit and 50,000 tons from East Pit)	400,000	38.80	.040	42.50	.014	2.00	38.03
Tilden Low Phos. (Selected from East Pit shipments)	50,000	37.50	.015	46.50	.011	2.00	36.75
Total.....	450,000						

From the above tables it will be noted that the low Phosphorus ore can be obtained only by analyzing each car and segregating those that contain the proper material. Using this method, a cargo can be obtained only by accumulating a sufficient number of cars and holding them for shipment. This arrangement, though not ideal, has proved more satisfactory than the old method of handling the product from Summit Pit.

The above estimated analyses of the 1940 production are the same as reported for 1939 and slightly different from those reported previously. The reasons for these changes were fully discussed in the report for 1938 and no material change is indicated since the reserves drilled previous to 1939 have since been blasted and are now broken and available for 1940 shipments.

For the reasons discussed in the report for 1938, it is recommended that the published guarantees for 1940 remain the same as those published for 1939, namely: Tilden Silica, 38.00 Iron Natural; Tilden Low Phos., 36.80 Iron Natural.

5. LABOR  
AND  
WAGES

a. Comments

1. Labor

Labor conditions during 1939 were satisfactory in that there was no shortage of men at any time. Of necessity, employment was intermittent due to irregularities in the production schedule. The number of employees averaged 30, the same as for the previous year.

N.R.A. regulations, as such, were officially discontinued in July, 1937 but have been adhered to ever since in that time-and-a-half was paid for all overtime work in excess of 40 hours in any one week or 8 hours in any one day.

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5. LABOR  
AND  
WAGES (CONT.)

b. Comparative Statement of Wages and Product

	<u>1939</u>	<u>1938</u>	<u>Increase</u>	<u>Decrease</u>
Product	170,276	85,589	84,687	
Number of Shifts and Hours	78 - 1-8 hr. 4 - 2-8 hr.	40 - 1-8 hr.	38 - 1-8 hr. 4 - 2-8 hr.	
Average number of men working	30	30		
Average Daily Wage	\$5.54	\$5.58		\$0.04
Tons per man per day	55.03	41.86	13.17	
Labor cost per ton (Labor Stmt.)	\$.104	\$.137		.033
Labor cost per ton (Cost sheet)	.121	.155		.034
Total number of days	3186.75	2044.5	1142.25	
Amount paid for labor as per Labor Statement	\$17,651.44	\$11,749.09	\$ 5,902.35	
Amount paid for labor as per Cost Sheet	20,600.65	13,226.41	7,374.24	

7. OPEN PIT  
OPERATIONS

a. Stripping

There were several separate stripping operations carried on during the year, the cost of which was charged to E. & A. No. 786 although most of them were not included in the original estimate. Stripping costs by company men and equipment were so much lower than previous work done by contractors that there was an ample reserve left in the E. & A. to handle these costs although the original quantities estimated have now been greatly exceeded.

The largest stripping operation was carried on along the North edge of the East Pit and was done by the D-8 tractor and bull-dozer. An itemized record of the costs will be found in the explanatory paragraphs following the record of the E. & A.

Another stripping operation in the East Pit consisted of removing 600 cu. yds. of overburden from the South side where a large accumulation was causing spillage into the pit during heavy rains. This work was also done with the D-8 tractor and bull-dozer.

Two small stripping operations were completed in the West Pit, one in the Lower Bench and the other in the extreme West end on the Upper Bench. The first consisted of the removal of 1,100 cu. yds. of material around the mouth of the new culvert under the L. S. & I. tracks and, the second, the moving of 1,500 cu. yds. along the West end of the face in the Upper Bench. Neither of these operations developed any new ore since the reserves in the Lower Bench had already been estimated and the material in the West end of the Upper Bench proved too badly contaminated with dikes to permit mining. This latter operation had the effect of definitely establishing the Westerly mining limit under the present set-up.

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7. OPEN PIT  
OPERATIONS (CONT.)

a. Stripping (Cont.)

The method of handling the charges under E. & A. No. 786 varies somewhat from the method in which the expenditures were actually made. The following is the actual record of these expenditures, some of which differ from the office copy, although the total amount is the same:

ORIGINAL ESTIMATE	WORK ACCOMPLISHED	EXPENDITURE 1939	PREVIOUS (1937-38)	TOTAL TO DATE	COST PER UNIT
<b>LOWER BENCH, WEST PIT:</b>					
Approach to Crusher Building (1)	Completed	-	\$ 519.03	\$ 519.03	
Moving Power Line.....\$ 1,000 (2)	"	-	638.95	638.95	
Addition to Crusher Pocket (3)	"	\$ 214.89		214.89	
Stripping 30,000 cu. yds.					
at 40¢ per yd..... 12,000	42,707 yds.	366.40	6,816.58	7,182.98	\$0.168 per cu. yd.
220 Lineal feet C.M.P.(24")					
at \$5.00 per ft. in place.. 1,100	Completed	84.62	1,014.28	1,098.90	\$4.99 per foot.
Clearing and Grubbing..... 500	"	-	528.43	528.43	
Washing..... 1,000	Nearly completed	28.96	4,386.32	4,415.28 (4)	
Casting L.S. & I. tracks..... 250	Completed	-	1,062.12	1,062.12	
Surfacing 3,000 cu. yds					
at 50¢ per yd..... 1,500	Nothing	-	-	-	
Miscellaneous Material..... 400	-	-	-	-	
<b>TOTAL.....\$17,750</b>					
Plus 10%..... 1,775					
<b>TOTAL LOWER BENCH.....\$19,525</b>		<b>\$ 694.87</b>	<b>\$ 14,965.71</b>	<b>\$15,660.58</b>	
Waste Rock - West Pit (3).... 0	1582 cu. yds.	-	315.52	315.52	\$0.199 per cu. yd.
Stripping 3,000 cu. yds 1,500	2700 cu. yds.	-	350.59	350.59	\$0.126 per cu. yd.
on West Side of West Pit at 50¢					
Stripping 2,000 cu. yds. on					
West Side of East Pit at 50¢ 1,000	2500 cu. yds.	-	909.25	909.25	\$0.36 per cu. yd.
North Side of East Pit (3)	7000 " "	699.99	-	699.99	\$0.10 " " "
West End of West Pit (3)	1500 " "	371.08	-	371.08	\$0.248 " " "
South Side of East Pit (3)	600 " "	25.11	-	25.11	\$0.042 " " "
<b>GRAND TOTAL..... \$22,025</b>		<b>\$ 1,791.05</b>	<b>\$ 16,541.07</b>	<b>\$ 18,332.12</b>	

- (1) Not included in original estimate. Charged to "Miscellaneous Materials" in office copy of E. & A.
- (2) This \$1,000 item is omitted in office copy of E. & A. and included in "Miscellaneous Materials", which was originally \$400.00.
- (3) Not included in original estimate.
- (4) Includes \$867.27 washing Upper Bench.

Most of the above operations were thoroughly discussed in the reports for 1937 and 1938. Following are remarks concerning the expenditures during the current year:

Addition to Crusher Pocket: This item of \$214.89 was the cost of revamping the crusher pocket to permit dumping from the West side by the new crawler-wagon.

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7. OPEN PIT  
OPERATIONS (CONT.)

a. Stripping (Cont.)

Stripping 30,000 cubic yards: This item of \$336.40 was expended as follows: \$182.40 during May, which includes stripping around the mouth of the culvert with the tractor and bull-dozer, cleaning out the culvert and several other miscellaneous items. The remainder of the charge, \$184.00, consisted of a portion of the monthly depreciation against the new tractor and equipment.

Placing Culvert Pipe: This item of \$84.62 handled the cost of placing the last 10' length North of the L. S. & I. tracks.

Washing: The item of \$28.96 was a charge for pump repairs.

North Side of East Pit: This relatively large stripping operation was handled for the most part by the D-8 tractor and bull-dozer and furnished an excellent opportunity for studying the cost of earth moving with this equipment. 7,000 cubic yards were removed an average distance in excess of 300 feet in 31½ days at an average rate of some 220 yds. per day including moving of equipment. The cost record of this operation is itemized in the report for the month of November. Briefly, the costs were as follows:

	<u>Total Before</u> <u>Depreciation</u>	<u>Depreciation</u>	<u>Total</u>
D-8 tractor expense	\$ 305.84	\$ 267.08	\$ 572.92
7,000 cu. yds. at	4.37¢	3.81¢	8.18¢
181,000 tons stripped at	0.17¢	0.15¢	0.32¢
Cletrac tractor and Miscellaneous	127.07	-	127.07
<b>Total Cost</b>	<b>\$ 432.91</b>	<b>\$ 267.08</b>	<b>\$ 699.99</b>
7,000 cu. yds. at	6.19¢	3.81¢	10.00¢
181,000 tons stripped at	0.24¢	0.15¢	0.39¢

West End of West Pit: This item of \$371.08 was the cost of moving 1,500 cubic yards under very difficult conditions due to the roughness of the ground and the depth of the overburden. No new ore was developed due to the presence of large intersecting dikes.

South Side of East Pit: This item of \$25.11 is the cost of moving 600 cubic yards a very short distance with the tractor and bull-dozer and includes labor and supplies only, without depreciation. The work was done to prevent further washing of sand and other lean material into the pit.

The stripping operations discussed above compare most favorably with the last jobs in the East Pit at a contract price of 50¢ per cubic yard.

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7. OPEN PIT  
OPERATIONS (CONP.)

b. Development

There was no development of new ore at this property during 1939 since the ore stripped had already been outlined by test drilling and the ore in the Lower Bench in the West Pit has been carried as developed ore for a number of years.

f. Drilling, Blasting & Explosives

1. Drilling

Primary blast hole churn drilling totaled 1,698 feet during 1939 as compared with 5730 feet during 1938, a decrease of 4,032'. One hole of 24' was lost during the current year as compared with none in 1938, 80' in 1937 and 446' in 1936. The effective footage in 1939 was, therefore, 1674'.

With the exception of 119' of 6" holes drilled to provide a drainage ditch from the sinking cut, Lower Bench, all of the current year's drilling was done with the 9" 29-T drills. The large campaign of 6" drilling in the sinking cut was completed in 1938 although not blasted until 1939. The record of the location of the 9" churn drilling during the year is as follows: W $\frac{1}{2}$  of West Pit - 184' - 2 holes to the West of the original row which was drilled in 1937. East end of West Pit - 924' - 15 holes - one complete row not yet blasted. Lower Bench, West Pit - 268' - 6 holes blasted in October. An additional 10' was drilled in starting the next row, the drilling of which is now postponed until 1940. East Pit - 169' - 4 holes - completing the drilling for the large shot in this area, most of which was drilled during 1938.

The item "Depreciation of Drilling Equipment" which was first added to the record of drilling costs in 1938, amounted to \$1.056 per foot for the 9" drills as compared with \$.45 in 1938. This large increase is due to the comparatively small amount of drilling done during the current year. No comparison of costs is being made between 9 and 6" holes since the 6" drilling campaign was not large enough to make the comparison significant. The total combined cost for the year was \$1.97 per foot, before depreciation, as compared with \$1.93 for 1938.

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7. OPEN PIT  
OPERATIONS (CONT.)

f. Drilling, Blasting & Explosives (Cont.)

1. Drilling (Cont.)

Cost of Operating 6" Churn Drills in Lower Bench, West Pit, 1939

Total Footage of Holes Drilled - - 119  
Total Footage of Holes Lost - - - 0  
Net Available Footage - - - - 119

<u>Operating</u>	<u>Labor</u>	<u>Supplies</u>	<u>Total</u>	<u>Cost Per Foot</u>
Drilling at Mine	\$ 204.92	\$ 8.00	\$ 212.92	1.788
Sharpening Bits	10.60	5.00	15.60	.131
Electric Power		6.00	6.00	.050
Truck & Tractor	20.44	12.00	32.44	.273
Building Roads	15.00	10.00	25.00	.210
Total Operating.....	\$ 250.96	\$ 41.00	\$ 291.96	2.452

<u>Maintenance</u>				
Drill Sharpener Equipment		87.92	87.92	.738

Total Maintenance and Operating.....	\$ 250.96	\$ 128.92	\$ 379.88	\$ 3.19
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Cost of Operating 9" Churn Drills in Lower Bench, West Pit, 1939

Total Footage of Holes Drilled - - - 302  
Total Footage of Holes Lost - - - - 24  
Net Available Footage - - - - - 278

<u>Operating</u>	<u>Labor</u>	<u>Supplies</u>	<u>Total</u>	<u>Cost Per Foot</u>
Drilling at Mine	\$ 280.40	\$ 5.00	\$ 285.40	\$ 1.027
Sharpening Bits	66.76	16.47	83.23	.299
Drilling Tools		100.32	100.32	.361
Electric Power		22.64	22.64	.081
Truck and Tractor	34.10	17.79	51.89	.186
Total Operating.....	\$ 381.26	\$ 162.22	\$ 543.48	1.954

<u>Maintenance</u>				
Drill Maintenance		82.75	82.75	.297
Drill Sharpener Equipment		19.21	19.21	.069
Total Maintenance.....	-	101.96	101.96	.366

Total Maintenance and Operating.....	\$ 381.26	\$ 264.18	\$ 645.44	\$ 2.321
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Depreciation on Churn Drill Equipment.....		293.62	293.62	1.056
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Total Maintenance, Operating and Depreciation.....	\$ 381.26	\$ 557.80	\$ 939.06	\$ 3.377
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7. OPEN PIT  
OPERATIONS (CONT.)

F. Drilling, Blasting & Explosives (Cont.)

1. Drilling (Cont.)

Cost of Operating 9" Churn Drills in W $\frac{1}{2}$  of West Pit, 1939

<u>Operating</u>	<u>Labor</u>	<u>Supplies</u>	<u>Total</u>	<u>Cost Per Foot</u>
Drilling at Mine	\$ 184.14	\$ 15.13	\$ 199.27	1.083
Sharpening Bits	54.80	28.00	82.80	.450
Electric Power		18.55	18.55	.100
Truck and Tractor	40.43	16.20	56.63	.307
Total Operating	\$ 279.37	\$ 77.88	\$ 357.25	1.940
 <u>Maintenance</u>				
Drill Maintenance	11.24	11.30	22.54	.120
Drill Sharpener Equipment			0	
Total Maintenance	\$ 11.24	\$ 11.30	\$ 22.54	.120
Total Maintenance and Operating.....	\$ 290.61	\$ 89.18	\$ 379.79	2.060
Depreciation on Churn Drill Equipment.....		194.70	194.70	1.056
Total Maintenance, Operating and Depreciation.....	\$ 290.61	\$ 283.88	\$ 574.49	3.116

Total Footage of Holes Drilled - - 184  
Total Footage of Holes Lost - - - 0  
Net Available Footage.- - - - 184

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7. OPEN PIT  
OPERATIONS (CONT.)

f. Drilling, Blasting & Explosives (Cont.)

1. Drilling (Cont.)

Cost of Operating 9" Churn Drills in E<sub>2</sub> of West Pit, 1939

Total Footage of Holes Drilled - - - 924  
Total Footage of Holes Lost - - - 0  
Net Available Footage - - - - - 924

<u>Operating</u>	<u>Labor</u>	<u>Supplies</u>	<u>Total</u>	<u>Cost Per Foot</u>
Drilling at Mine	\$ 658.20	\$ 98.35	\$ 756.55	.819
Sharpening Bits	164.02	62.59	226.61	.246
Pipe & Fittings		58.66	58.66	.064
Rope		113.18	113.18	.120
Electric Power		108.52	108.52	.118
Truck and Tractor	159.56	45.54	205.10	.222
Total Operating	\$ 981.78	\$ 486.84	\$1,468.62	1.589
 <u>Maintenance</u>				
Drill Sharpener Equipment			0	
Drill Maintenance	5.52	11.63	17.15	.018
Total Maintenance	5.52	11.63	17.15	.018
 Total Maintenance and Operating	\$ 987.30	\$ 498.47	\$1,485.77	1.607
 Depreciation on Churn Drill Equipment.....		975.74	975.74	1.056
 Total Maintenance, Operating and Depreciation....	\$987.30	\$1,474.21	\$2,461.51	2.663

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7. OPEN PIT  
OPERATIONS (CONT.)

f. Drilling, Blasting & Explosives (Cont.)

1. Drilling (Cont.)

Net Available Footage - 169. Lost - 0.

Cost of Operating 9" Churn Drills - East Pit - 1939

<u>Operating</u>	<u>Labor</u>	<u>Supplies</u>	<u>Total</u>	<u>Cost Per Foot</u>
Drilling at Mine	\$ 82.32	\$ 24.27	\$ 106.59	.626
Sharpening Bits	68.90	35.81	104.71	.620
Pipe and Fittings		111.64	111.64	.662
Electric Power		7.70	7.70	.045
Truck and Tractor	65.61	10.00	75.61	.447
Total Operating.....	\$ 216.83	\$ 189.42	\$ 406.25	2.400
<u>Maintenance</u>				
Drill Sharpener Equipment			0	
Drill Maintenance	2.54		2.54	.020
Total Maintenance	\$ 2.54	\$ -	\$ 2.54	.020
Total Maintenance and Operating.....	\$ 219.37	\$ 189.42	\$ 408.79	2.420
Depreciation of Churn Drill Equipment.....		178.57	178.57	1.056
Total Maintenance, Operating and Depreciation.....	\$ 219.37	\$ 367.99	\$ 587.36	3.476

Combined Cost of Operating Churn Drills, 1939

	<u>Total Net Footage</u>	<u>Total Cost.</u>	<u>Cost Per Foot</u>
West Pit, Lower Bench, 6" Holes	119	\$ 379.88	\$ 3.19
W $\frac{1}{2}$ of West Pit, 9" Holes	184	379.79	2.06
E $\frac{1}{2}$ of West Pit, 9" Holes	924	1,485.77	1.607
Lower Bench, West Pit, 9" Holes	278	645.44	2.321
East Pit, 9" Holes	169	408.79	2.420
Total.....	1,674	\$ 3,299.67	\$ 1.971
Depreciation of churn drill Equipment.....		1,642.63	.981
Total.....		\$ 4,942.30	\$ 2.952

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7. OPEN PIT  
OPERATIONS (CONT.)

f. Drilling, Blasting & Explosives (Cont.)

1. Drilling (Cont.)

As was to be expected, the drilling cost in the East Pit was much higher than that in the remainder of the property, amounting to \$2.42 as compared with \$2.06 in the W $\frac{1}{2}$  of the West and \$1.61 in the E $\frac{1}{2}$  of the West Pit. The comparatively high cost of \$2.32 in the Lower Bench is due to the trouble experienced on the first hole which was lost after having been drilled to a depth of 24'. Subsequent attempts to recover the tools resulted in the high cost.

The following tables show a comparison between the drilling speeds of the different sized machines in the several areas and the average footage per bit:

Drilling Speeds, Year 1939

<u>Location</u>	<u>Drill No.</u>	<u>Shifts Worked</u>	<u>Footage Drilled</u>	<u>Average Footage Per 8 Hr. Shift</u>
Lower Bench, West Pit	6"	5	119	9.1
W $\frac{1}{2}$ of West Pit	9"	8	184	16.00
East End of West Pit	9"	7	485	21.08
East End of West Pit	9"	8	439	20.90
Lower Bench West Pit	9"	7	278	14.63
East Pit	9"	7	83	16.60
East Pit	9"	8	86	10.75

	<u>Bits Used</u>	<u>Footage Obtained</u>	<u>Footage Per Bit</u>
Lower Bench, West Pit 6"	12	119	9.09
West Half of West Pit 9"	50	184	3.68
East End of West Pit 9"	154	924	6.00
Lower Bench West Pit 9"	29	278	9.58
East Pit 9"	51	169	3.31

In the above tables, the extreme hardness of the material in the West half of the West Pit and the East Pit is apparent in the footage obtained per bit. The relatively low footage per shift in the lower bench is due to the difficulty of maneuvering the machine into position and not to the hardness of the material.

2. Blasting

There were four primary blasts during the year, one in the East Pit, one in the W $\frac{1}{2}$  of the West Pit and two in the sinking out of the Lower Bench. These shots broke a total estimated tonnage of 283,000 tons plus a considerable amount of overrun, some of which has already been loaded and shipped. In general, loading and blasting practice was the same as that used during the preceding year with the exception of the introduction of the new Ensign-Bickford Primacord fuse in place of the Cordeau-Bickford fuse formerly used. The bulk of the above tonnage was obtained by the use of the new 9" holes with the exception of the first blast in the sinking out and several holes in the West half of the West Pit

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7. OPEN PIT  
OPERATIONS (CONT.)

f. Drilling, Blasting & Explosives (Cont.)

2. Blasting (Continued)

which were drilled in 1937. The first blast in the sinking cut was unusual in that it was necessary to space the holes very closely in order to insure proper fragmentation. In the future, 9" holes will be used entirely since experience has shown a definite decrease in drilling costs, and improved fragmentation. Seven of these 6" holes were used on 10' centers to break out a drainage ditch, the tonnage from which will not be fully recovered for some time.

The blast in the East Pit which produced 130,000 tons was the largest that has ever been put off in that area and consisted of a single row of 34 holes which went around the Pit from the Southeast corner to the Northwest corner.

At the end of the year, there were large reserves of broken ore both in the East Pit and the  $W\frac{1}{2}$  of the West Pit and one row of 15 holes ready in the  $E\frac{1}{2}$  of the West Pit. The following is the table of blast results:

<u>WEST PIT</u>						
<u>Blast No.</u>	<u>Date</u>	<u>No. of Holes.</u>	<u>Footage</u>	<u>Pounds Powder</u>	<u>Estimated Tonnage</u>	<u>Tons of Ore Per Pound of Powder</u>
1 (Lower Bench)	6-13-39	(6") 95	2,024	7,850	21,000	2.7
2 ( $W\frac{1}{2}$ of W.Pit)	9-20-39	(6") 6 (9") 18	596 1,734	5,500 35,000	17,000 103,000	3.1 2.94
3 (Lower Bench)	10-5-39	(9") 6	268	3,950	12,000	3.05
<hr/>						
Total West Pit (6")		101	2,620	13,350	38,000	2.85
Total West Pit (9")		24	2,002	38,950	115,000	2.95
GRAND TOTAL WEST PIT		125	4,622	52,300	153,000	2.93

<u>EAST PIT</u>						
1	9-1-39	(9") 34	3,041	40,000	130,000	3.25
<hr/>						
TOTAL TILDEN MINE		159	7,663	92,300	283,000	3.07

The usual amount of secondary drilling and blasting was carried on throughout the shipping season in connection with loading operations. In addition, the large program of secondary drilling and blasting along the North toe in the East Pit was completed just prior to the primary blast in September. All of the secondary drilling was done with detachable jackbits and water, utilizing both jack-hammer and tripod drifter drills.

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7. OPEN PIT  
OPERATIONS (CONT.)

f. Drilling, Blasting & Explosives (Cont.)

2. Blasting (Cont.)

STATEMENT OF COST OF EXPLOSIVES USED FOR YEAR ENDING

DECEMBER 31, 1939

Primary Blasting.

<u>Kind</u>	<u>Quantity</u>	<u>Price</u>	<u>Amount</u>
Gelamite #1.....	250 lbs.	\$ 11.50	\$ 28.75
Gelamite #2.....	51,500 "	11.50	5,922.50
40% L.F. Gelatine.....	750 "	10.50	78.75
75% L.F. Gelatine.....	20,050 "	13.25	2,656.63
90% L.F. Gelatine.....	19,500 "	17.39	3,391.00
Total Powder.....	92,050 lbs.	\$ 13.12	\$12,077.63

Blasting Supplies

Primacord Bickford Fuse, regular....	3,000 ft.	\$ 41.50 M.	124.50
Primacord Bickford Fuse, wire bound.	11,000 "	51.50 M.	566.50
Total Blasting Supplies.....	14,000	\$ 49.35	\$ 691.00

TOTAL ALL EXPLOSIVES..... \$12,768.63

Total Ore Blasted in 1939.....	283,000 tons.
Pounds of Powder per ton of Ore.....	.326
Cost per ton for powder.....	.0426
Cost per ton for fuse, caps, etc.....	.0024
Cost per ton for all explosives.....	.0451
Average Price per lb. for Powder.....	.1512

Secondary Blasting

<u>Kind</u>	<u>Quantity</u>	<u>Price</u>	<u>Amount</u>
40% Gelatine.....	100 lbs.	\$ 10.50	\$ 10.50
60% Gelatine.....	2,200 "	12.29	270.50
80% Gelatine.....	575 "	14.50	83.38
Total Powder.....	2,875 lbs.	\$ 12.67	\$ 364.38

Blasting Supplies

Connecting Wire.....	24 Lb:	.40 Lb.	9.60
Primacord fuse.....	1,500 ft.	41.50 M	62.25
Clover Fuse.....	6,000 ft.	5.04 M	30.24
#6 Blasting Caps.....	1,300	12.20 M	15.86
Total Blasting Supplies.....			\$117.95
Total Powder.....			364.38
Total Secondary Blasting Cost...			<u>\$ 482.33</u>

Product.....	170,276 tons.
Pounds of Powder per ton of Ore.....	.017
Cost per ton for powder.....	.0021
Cost per ton for fuse, caps, etc.....	.0007
Cost per ton for all explosives.....	.0028
Average Price per lb. for powder.....	.1267

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7. OPEN PIT  
OPERATIONS (CONT.)

f. Drilling, Blasting & Explosives (Cont.)

2. Blasting (Cont.)

COMBINED TOTAL BLASTING COSTS

<u>Kind</u>	<u>Quantity</u>	<u>Price</u>	<u>Amount</u>
40% L.F. Gelatine.....	850 lbs.	\$ 10.50	\$ 89.25
Gelamite #1.....	250 "	11.50	28.75
Gelamite #2.....	51,500 "	11.50	5,922.50
60% L.F. Gelatine.....	2,200 "	12.29	270.50
75% L.F. Gelatine.....	20,050 "	13.25	2,656.63
80% L.F. Gelatine.....	575 "	14.50	83.38
90% L.F. Gelatine.....	19,500 "	17.39	3,391.00
Total Powder.....	94,925 lbs.	\$ 13.11	\$12,442.01

Blasting Supplies

Connecting Wire.....	24 Lb.	\$ .40 Lb.	\$ 9.60
Primacord Bickford Fuse, regular....	4,500 Ft.	41.50 M	186.75
Primacord Bickford Fuse, wire bound..	11,000 "	51.50 M	566.50
Clover Fuse.....	6,000 "	5.04 M	30.24
#6 Blasting Caps.....	1,300	12.20 M	15.86
Total Blasting Supplies.....			\$ 808.95

TOTAL ALL EXPLOSIVES..... \$13,250.96

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7. OPEN PIT  
OPERATIONS (CONC.)

f. Drilling, Blasting & Explosives

3. Statement of Cost of Drilling and Blasting 21,000 tons of Ore in the  
Original Sinking Cut of the Lower Bench, West Pit,

Net Feet of 6" Holes Drilled - 2024' - Lost - 0.

<u>Drilling Cost</u> <u>Operating</u>	<u>Labor</u>	<u>Supplies</u>	<u>Total</u>	<u>Cost</u> <u>Per Foot</u>	<u>Cost</u> <u>Per Ton.</u>
Drilling at Mine.....	\$ 2,074.08	\$ 110.38	\$ 2,184.46	1.079	
Sharpening Bits.....	185.42	67.83	253.25	.125	
Pipe and Fittings.....	97.29	375.91	473.20	.233	
Rope.....		14.80	14.80	.007	
Drilling Tools.....			0		
Electric Power.....		232.08	232.08	.114	
Truck and Tractor.....	148.53	78.98	227.51	.112	
Building Roads.....	210.00	10.00	220.00	.112	
Total Operating.....	\$ 2,715.32	\$ 889.98	\$ 3,605.30	1.782	
<u>Maintenance</u>					
Drill Sharpener Equipment	33.50	87.92	121.42	.057	
Drill Maintenance.....	163.19	69.81	233.00	.115	
Total Maintenance.....	196.69	157.73	354.42	.172	
Total Maintenance and Operating.....	\$ 2,912.01	1,047.71	3,959.72	1.954	.188
<u>Primary Blasting Costs</u>					
Loading Holes.....	\$ 151.74		151.74	.	.007
Cleaning Holes.....	217.76	173.86	391.62		.019
Primary Drilling* .....	194.92	272.07	466.99		.023
Explosives.....		1,362.38	1,362.38		.064
Other Supplies.....		4.41	4.41		.
Total Primary Costs...	\$ 564.42	1,812.72	2,377.14		.113
Grand Total Operating, Maintenance and Primary Blasting.....	\$ 3,476.43	2,860.43	6,336.86		.301

\* This item consisted of primary work with jackhammers which was necessary to remove a shallow portion of the ore body which was not sufficiently deep to warrant churn drilling. These small holes were blasted just prior to the main shot.

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7. OPEN PIT  
OPERATIONS (CONT.)

f. Drilling, Blasting & Explosives (Cont.)

3. Statement of Cost of Drilling and Blasting 12,000 tons of ore in the Second Primary Blast in the Lower Bench, West Pit.

Net Feet of 9" Holes Drilled - 278' - Lost 24'.

<u>Drilling Cost</u> <u>Operating</u>	<u>Labor</u>	<u>Supplies</u>	<u>Total</u>	<u>Cost</u> <u>Per Foot</u>	<u>Cost</u> <u>Per Ton</u>
Drilling at Mine.....	\$ 280.40	\$ 5.00	\$ 285.40	1.027	
Sharpening Bits.....	66.76	16.47	83.23	.299	
Drilling Tools.....		100.32	100.32	.361	
Electric Power.....		22.64	22.64	.081	
Truck and Tractor.....	34.10	17.79	51.89	.186	
Total Operating.....	\$ 381.26	\$ 162.22	\$ 543.48	1.954	
<u>Maintenance</u>					
Drill Maintenance.....		82.75	82.75	.297	
Drill Sharpener Equipment.....		19.21	19.21	.069	
Total Maintenance.....		\$ 101.96	\$ 101.96	.366	
Total Maintenance and Operating.....	\$ 381.26	\$ 264.18	\$ 645.44	.231	.053
Depreciation on Churn Drill Equipment.....		293.62	293.62	1.056	.024
Total Maintenance, Operating and Depreciation.....	\$ 381.26	\$ 557.80	\$ 939.06	3.377	.077
<u>Primary Blasting Costs</u>					
Labor Loading Holes.....	33.40		33.40		.002
Explosives.....		586.25	586.25		.048
Other Supplies.....		6.62	6.62		
Total Blasting Costs....	\$ 33.40	\$ 592.87	\$ 626.27		.050
Grand Total, Operating, Maintenance, Depreciation, and Primary Blasting Costs	\$ 414.66	\$ 1,150.67	\$ 1,565.33		.127

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7. OPEN PIT  
OPERATIONS (CONT.)

f. Drilling, Blasting & Explosives (Cont.)

3. Statement of Cost of Drilling and Blasting 130,000 tons of Ore in the East Pit

Net Feet of 9" Holes Drilled - 3,041, Lost - 0.

<u>Drilling Cost</u> <u>Operating</u>	<u>Labor</u>	<u>Supplies</u>	<u>Total</u>	<u>Cost</u> <u>Per Foot</u>	<u>Cost</u> <u>Per Ton</u>
Drilling at Mine.....	\$2,291.84	\$ 234.32	\$2,526.16	.844	
Sharpening Bits.....	804.07	287.72	1,091.79	.349	
Pipe and Fittings.....	59.63	409.80	469.43	.155	
Rope.....		127.50	127.50	.042	
Drilling Tools.....	15.00	194.10	209.10	.068	
Electric Power.....		480.18	480.18	.155	
Truck and Tractor.....	739.02	233.44	972.46	.319	
Total Operating.....	\$3,909.56	\$ 1,967.06	\$5,876.62	1.932	
<u>Maintenance</u>					
Drill Maintenance.....	202.44	176.39	378.83	.124	
Drill Sharpener Equipment..	86.07	41.28	127.35	.042	
Total Maintenance.....	\$ 288.51	\$ 217.67	\$ 506.18	.166	
Total Maintenance and Operating.....	\$4,198.07	\$ 2,184.73	\$6,382.80	2.098	.0491
Depreciation on Churn Drill Equipment.....		1,404.00	1,404.00	.461	.0108
Cleaning Holes.....	\$ 494.30	282.88	777.18	.253	.0059
Total Maintenance, Operating and Depreciation.....	\$4,692.37	\$ 3,871.64	\$8,563.98	2.812	.0658
<u>Primary Blasting Costs</u>					
Loading Holes.....	\$ 173.36		173.36		.0013
Explosives.....		5,541.25	5,541.25		.0426
Other Supplies.....		92.10	92.10		.0007
Total Blasting Costs.....	\$ 173.36	5,633.35	5,806.71		.0446
Grand Total, Operating, Maintenance, Depreciation and Primary Blasting.....	\$4,865.73	\$9,504.96	\$14,370.69		.1104

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7. OPEN PIT  
OPERATIONS (CONT.)

f. Drilling, Blasting & Explosives (Cont.)

3. Statement of Cost of Drilling and Blasting 103,000 Tons of Ore in the  
West Half of the West Pit

Net Feet of Holes Drilled (9") - 1734, Lost 80.

<u>Drilling Cost</u> <u>Operating</u>	<u>Labor</u>	<u>Supplies</u>	<u>Total</u>	<u>Cost</u> <u>Per Foot</u>	<u>Cost</u> <u>Per Ton</u>
Drilling at Mine.....	\$1,224.21	\$ 124.84	\$1,349.05	.778	
Sharpening Bits.....	424.83	150.86	575.69	.332	
Pipe and Fittings.....	15.00	215.00	230.00	.133	
Rope.....		17.34	17.34	.010	
Electric Power.....		194.20	194.20	.112	
Truck and Tractor.....	329.46	157.79	487.25	.281	
Total Operating.....	\$1,993.50	\$ 860.03	\$2,853.53	1.646	
<u>Maintenance</u>					
Drill Maintenance.....	80.90	122.00	202.90	.117	
Drill Sharpener Equipment	25.00	5.09	30.09	.017	
Total Maintenance.....	\$ 105.90	\$ 127.09	\$ 232.99	.134	
Total Maintenance, and Operating.....	\$2,099.40	\$ 987.12	\$3,086.52	1.780	.030
<u>Depreciation on Churn</u>					
Drill Equipment.....		194.64	194.64	.114	.001
Grand Total, Operating, Maintenance & Depreciation	\$2,099.40	\$ 1,181.76	\$3,281.16	1.894	.031
Cleaning Holes.....	58.80		58.80		
<u>Primary Blasting Costs</u>					
Loading Holes.....	\$ 100.00		100.00		.001
Explosives.....		4,495.30	4,495.30		.046
Other Supplies.....		10.00	10.00		
Total Blasting Costs....	\$ 100.00	4,505.30	4,605.30		.047
Grand Total, Operating, Maintenance, Depreciation and Blasting Costs.....	\$2,258.20	\$ 5,687.06	\$7,945.26		.078

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7. OPEN PIT  
OPERATIONS (CONT.)

f. Drilling, Blasting & Explosives (Cont.)

3. Statement of the Cost of Drilling and Blasting 17,000 tons of Ore in the  
West Half of the West Pit.

Net Feet of Holes Drilled - 596'. Lost - 0. (6")

<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.....	\$520.30	\$ 100.24	\$ 620.54	1.041	
Sharpening Bits.....	59.00	28.61	87.61	.147	
Pipe and Fittings.....	15.00	17.19	32.19	.054	
Rope.....		39.34	39.34	.066	
Drilling Tools.....		81.10	81.10	.136	
Electric Power.....		64.67	64.67	.109	
Truck and Tractor.....	41.72	23.98	65.70	.110	
Total Operating.....	\$636.02	\$ 355.13	\$ 991.15	1.663	
 <u>Maintenance</u>					
Drill Maintenance.....	10.00	7.28	17.28	.029	
Drill Sharpener Equipment..		2.98	2.98	.005	
Total Maintenance.....	\$ 10.00	10.26	20.26	.034	
 Total Maintenance and					
Operating.....	\$ 646.02	\$ 365.39	\$ 1,011.41	1.697	.059
 <u>Primary Blasting Costs</u>					
Loading Holes.....	\$ 34.20		34.20		.002
Explosives.....		783.45	783.45		.045
Other Supplies.....		10.00	10.00		.001
Total Blasting Costs.....	\$ 34.20	793.45	827.65		.048
 Grand Total, Operating, Maintenance, and Primary					
Blasting Costs.....	\$680.22	\$ 1,158.84	\$1,839.06		.107

There are several significant conclusions to be drawn from a comparison of the above drilling and blasting costs:

In the opening blast in the sinking cut of the Lower Bench, it was necessary to space the holes closely (12' x 12 $\frac{1}{2}$ ') and load them rather heavily in order to insure the proper breaking of the material. In spite of the fact that there is no direct depreciation charge made on the 6" machines, the cost per ton of the material thus drilled and blasted was 30¢ as compared with 12.7¢ per ton for the next shot in the same cut in which a single row of 9" holes was blasted. In addition, this second blast absorbed a depreciation charge of \$1.05 per foot or a total of \$293.62.

The cost of 11¢ per ton in the East Pit is somewhat less than in the sinking cut of the Lower Bench due to the fact that the bulk of the drilling was done in 1938 when the depreciation rate was less than half that in 1939, amounting to \$.01 per ton instead of \$.024. In the West half of the West Pit, the bulk of the

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7. OPEN PIT  
OPERATIONS (CONT.)

f. Drilling, Blasting & Explosives (Cont.)

3. (Continued)

drilling was done in 1937 with no depreciation on the drilling equipment charged directly, with the exception of the two holes to the West which were drilled during the current year. This blast provides an excellent comparison between the cost of operating the 6" and 9" drills, the cost per ton of broken ore being .107 for the former and \$.078 for the latter, a difference of 3¢ per ton.

g. Loading Operations

Loading was begun on May 1st, slightly more than a month earlier than the previous year and continued intermittently on a single shift per day basis, with the exception of four days when operations were on a two shift basis. 78 single shifts and 4 double shifts were worked in all, a total of 86, during which 170,276 tons were loaded at the rate of 1,980 tons per 8 hour shift. As was explained in Paragraph 2e, this decrease in daily product was due to the fact that operations were conducted for 27 shifts with one shovel only, loading Low Phos. ore in the East Pit. The actual average daily output per 8 hour shift of three shovels was 2,505.

No. 31 shovel worked throughout the year in the East Pit, with Nos. 29 and 46 in the West. As soon as the sinking cut was blasted, No. 46 was moved down the incline for the rest of the season, loading into the new Athey crawler-wagon drawn by the Caterpillar D-8 tractor. No. 29 shovel worked alternately in both the East and West halves of the Upper Bench in the West Pit, thereby accomplishing a proper mixture of the different grades so that the output as a whole was within the guarantee. The use of the tractor and crawler-wagon released one of the three ore trains from the West Pit, thus enabling the East Pit to be operated with two trains instead of one. This had the effect of materially increasing the output of the property as a whole.

The large amounts of dike and other lean material in the West half of the West Pit made it rather difficult to keep up the grade of the ore and this was accomplished only by means of loading out large quantities of this lean material and dumping it on the waste pile. A considerable amount of this material was handled with the tractor and wagon during idle shifts at the property and the remainder with the locomotives and dump cars.

The following is a record of the rock removed, the cost of which was charged to the Waste Pile account.

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7. OPEN PIT  
OPERATIONS (CONT.)

g. Loading Operations (Cont.)

<u>Locomotives and Cars</u>							
<u>Locomotives</u>	<u>Power Shovels</u>	<u>Total</u>		<u>Cu. Yds.</u>	<u>Cost Per</u>		
<u>Operating</u>	<u>Operating</u>				<u>Cu. Yard</u>		
\$94.48	\$102.44	\$ 196.92		2,191	\$ .089		
<u>Caterpillar Tractor and Wagon</u>							
<u>Tractor</u>	<u>Power</u>	<u>Total</u>		<u>Cu. Yds</u>	<u>Cost Per</u>	<u>Cost Per Cu.</u>	
<u>Operating</u>	<u>Shovels</u>				<u>Cu. Yard</u>	<u>Depreciation</u>	<u>Yd. after</u>
	<u>Operating</u>					<u>Total</u>	<u>Depreciation</u>
\$139.75	\$216.44	\$356.19		4,433	\$ .080	\$198.61	\$554.80
							\$ .125

In addition to the above, \$45.00 was expended in picking out rock during loading operations. The total expenditure for rock during the year was \$796.72 for 6,624 cu. yds., at an average cost of \$.12 per yard. This compares with 1,582 cu. yds. of rock loaded out during 1938 at an average cost of \$.181.

The loading of the special cargo of high density stone for Merritt-Chapman & Scott Company, contractors of New York City, was discussed at some length in the report for 1938. This operation was completed in 1939 with the following costs:

Labor - - -	\$ 98.40
Supplies - - -	10.35
Total - - -	\$108.75 - 171½ tons at 63.3¢.

This compares with the cost record in 1938 of 1,056 tons at \$.649.

The D-8 tractor and crawler wagon proved very efficient in transporting the ore up the 10% incline from the Lower Bench. 38,269 tons were thus hauled at the following costs:

Operating (Labor and Supplies)	\$ 542.60 - 1.42¢ per ton.
Depreciation.....	1,584.09 - 4.14¢ " "
Total Tractor Haulage.....	\$2,126.69 - 5.56¢ per ton.

These costs compare with a three year history at the Tilden Mine with locomotives and cars of \$.063 per ton exclusive of all depreciation charges. 790,270 tons were hauled over the period in question.

During the current season, 38,269 tons were handled in 52 operating shifts at an average rate of 736 tons per day or 92 tons per hour.

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8. COST OF OPERATING

a. Comparative Mining Costs

	<u>1939</u>	<u>1938</u>	<u>Increase</u>	<u>Decrease</u>
Production.....	170,276	85,589	84,687	
Average Daily Product.....	1,980	2,140		160
Tons per man per day.....	55.03	41.86	13.17	
Number of days operating.....	86	40	46	
Number of shifts and hours....	78-1-8 hr. 4-2-8 hr.	40-1-8 Hr.	38	4
<u>Cost</u>				
Pit Operating Accounts.....	.315	.290	.025	
Pit General Accounts.....	.052	.062		.010
Cost at Mine.....	<u>.367</u>	<u>.352</u>	<u>.015</u>	
Idle & Winter Expense.....	.077	.357		.280
Total Cost at Mine.....	<u>.444</u>	<u>.709</u>		<u>.265</u>
<u>Depreciation</u>				
Plant & Equipment.....	.047	.063		.016
Taxes.....	.046	.082		.036
Stripping.....	.027	.011	.016	
Grand Total Cost at Mine.....	<u>.564</u>	<u>.865</u>		<u>.301</u>
<u>Expense Beyond Mine</u>				
Freight - Rail.....	.650	.640	.010	
Lake Freight.....	.880	.850	.030	
Cargo Insurance and Analysis..	.010	.010		
Shrinkage.....	.012	.015		.003
TOTAL COST LOWER LAKES.....	<u>2.116</u>	<u>2.380</u>		<u>.264</u>

b. Detailed Cost Comparison

1. Days and Shifts

In 1939, this property operated a total of 86 shifts as compared with 40 in 1938, an increase of 46 shifts.

2. Production

Production in 1939 was 170,276 tons, an increase of 84,687 over 1938 when 85,589 tons were produced. The average daily product for 1939 shows a decrease of 160 tons per 8 hour shift, being 1,980 tons as compared with 2,140 in 1938. As was explained in paragraph 2e, this decrease was due entirely to the fact that loading was carried on during 27 of the operating shifts with one shovel only instead of the usual three.

3. Cost of Production

In 1939, the cost in cars at the mine before depreciation and taxes was .444 as compared with .709 in 1938. This decrease of .265 was due to some extent to the increase in production and to a greater extent to the fact that the 1938 production absorbed a large part of the big winter repair program following the season of 1937.

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8. COST OF OPERATING (CONT.)

b. Detailed Cost Comparison (Cont.)

4. Open Pit Costs

	<u>1939</u>	<u>1938</u>	<u>Increase</u>	<u>Decrease</u>
Shifts and Hours.....	78 - 1-8 hr. 4 - 2-8 hr.	40 - 1-8 hr.	38 4	
Production Tons.....	170,276	85,589	84,687	
Average Product per 8 hr. Shift	1,980	2,140		160
Number of Shifts worked.....	86	40	46	

PIT OPERATIONS

	<u>1939</u>		<u>1938</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>
<u>Direct Ore</u>								
1. Drilling & Blasting.....	\$ 21,465.27	.127	\$ 9,358.40	.110	\$12,106.87	.017		
2. Power Shovels Operating.....	5,461.11	.032	2,948.17	.034	2,512.94			.002
3. Power Shovels Maintenance.....	3,991.16	.023	1,039.86	.012	2,951.30	.011		
4. Locos. & Cars Operating.....	4,840.02	.028	2,772.68	.032	2,067.34			.004
5. Locos. & Cars Maintenance.....	188.09	.001	452.67	.005			\$ 264.58	.004
6. Track Expense.....	1,559.48	.009	1,068.21	.013	491.27			.004
6A. D-8 Tractor Operating.....	2,126.69	.013			2,126.69	.013		
6B. D-8 Tractor Maintenance.....	70.65	.000			70.65	.000		
<b>TOTAL DIRECT ORE..</b>	<b>\$ 39,702.47</b>	<b>.233</b>	<b>\$17,639.99</b>	<b>.206</b>	<b>\$22,062.48</b>	<b>.027</b>		

General Pit Expense

8. Water Supply.....	\$ 4.78	.000	85.99	.001			81.21	.001
10. Crushing and Screening.....	9,150.97	.053	3,278.67	.038	5,872.30	.015		
11. General Open Pit Expense.....	3,376.96	.020	2,778.58	.033	598.38			.013
12. Open Pit Supts.....	779.37	.005	807.49	.009			28.12	.004
14. Waste Pile Expense.	433.94	.003	268.65	.003	165.29			
15. Exploration Drilling.....	189.11	.001	3.65	.000	185.46	.001		
<b>TOTAL GENERAL EXPENSE..</b>	<b>\$ 13,935.13</b>	<b>.082</b>	<b>7,223.03</b>	<b>.084</b>	<b>6,712.10</b>			<b>.002</b>
<b>TOTAL PIT OPERATION...</b>	<b>\$ 53,637.60</b>	<b>.315</b>	<b>24,863.02</b>	<b>.290</b>	<b>28,774.58</b>	<b>.025</b>		

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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>1939</u>		<u>1938</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	\$ 1,073.60	.006	\$ 628.26	.007	\$ 445.34	.		.001
17. Mechanical and Electrical Engineering.....	156.48	.001	172.36	.002			\$ 15.88	.001
18. Analysis & Grading	1,665.10	.010	498.35	.006	1,166.75	.004		
19. Safety Department.	106.74	.001	131.51	.002			24.77	.001
20. Local & Gen. Welfare	296.00	.002	171.00	.002	125.00			
21. Special Expense	389.70	.002	222.94	.003	166.76			.001
22. Ishpeming Office	803.00	.005	460.00	.005	343.00			
23. Mine Office	2,000.53	.011	1,287.00	.015	713.53			.004
24. Insurance	265.96	.002	214.83	.003	51.13			.001
25. Personal Injury	735.50	.004	462.76	.005	272.74			.001
26. Social Security Taxes	892.36	.005	585.74	.007	306.62			.002
27. Employees Vacation Pay	536.35	.003	418.27	.005	118.08			.002
<b>TOTAL GENERAL MINE EXPENSE</b>	<b>8,921.32</b>	<b>.052</b>	<b>5,253.02</b>	<b>.062</b>	<b>3,668.30</b>			<b>.010</b>
<b>IDLE &amp; WINTER EXPENSE</b>	<b>13,128.17</b>	<b>.077</b>	<b>30,537.71</b>	<b>.357</b>			<b>17,409.54</b>	<b>.280</b>
<b>COST OF PRODUCTION</b>	<b>\$ 75,687.09</b>	<b>.444</b>	<b>60,653.75</b>	<b>.709</b>	<b>15,033.34</b>			<b>.265</b>
28. Deprn. Plant & Equip.	7,913.76	.047	5,394.65	.063	2,519.11			.016
29. Amortization Stripping	4,642.69	.027	950.13	.011	3,692.56	.016		
30. Taxes	7,789.98	.046	7,050.74	.082	739.24			.036
<b>COST AT MINE</b>	<b>\$ 96,033.52</b>	<b>.564</b>	<b>74,049.27</b>	<b>.865</b>	<b>21,984.25</b>			<b>.301</b>
31. Inventory Adjustment	8.56	.000			8.56			
<b>TOTAL COST AT MINE</b>	<b>\$ 96,042.08</b>	<b>.564</b>	<b>74,049.27</b>	<b>.865</b>	<b>21,992.81</b>			<b>.301</b>

No explanation is made for changes in the above cost items unless the increase or decrease is large enough to be significant.

1. Drilling & Blasting

This increase of .017 is due to the extremely high cost per ton in the operation of drilling and blasting the original sinking cut in the Lower Bench of the West Pit.

3. Power Shovels - Maintenance

This increase of .011 is due to the extensive repairs which were made on the boom and dipper handle of No. 31 electric shovel.

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**8. COST OF  
OPERATING (CONT.)**

**b. Detailed Cost Comparison (Cont.)**

**4. Open Pit Costs (Cont.)**

**10. Crushing and Screening**

This increase of .015 is due to the expense of replacing the broken frame in the West 10" gyratory crusher and installing a complete new set of concaves in the 42" primary crusher.

**11. General Open Pit Expense**

This decrease of .013 is due to the increase in production.

**Idle and Winter Expense**

This large decrease of .280 is due in part to the increase in production but principally to the fact that a large portion of the big winter and idle expense program following the 1937 season was charged to the small production in 1938 since the bulk of the work was done after the end of the year. Somewhat more than half of the cost of production during 1938 was due to this winter and idle expense.

For purposes of record the idle expense for the current year is listed below:

**Idle Expense**

	<u>Labor</u>	<u>Supplies</u>	<u>Total</u>
January - - - - -	\$ 955.83	\$ 2,021.51	\$ 2,977.34
February - - - - -	668.45	703.40	1,371.85
March - - - - -	453.25	379.64	832.89
April - - - - -	744.00	263.12	1,007.12
May - - - - -	384.32	314.99	699.31
November - - - - -	1,052.07	1,044.82	2,096.89
December - - - - -	1,891.28	2,251.49	4,142.77
Total - - - - -	<u>\$6,149.20</u>	<u>\$ 6,978.97</u>	<u>\$ 13,128.17</u>

The above charges include the cost of constructing a garage and repair shed for the D-8 tractor and wagon, which totaled \$1,074.71 for labor and supplies.

**28. Depreciation of Plant & Equipment**

The decrease of .016 in this item is due to the increase in production.

**29. Amortization of Stripping**

This increase of .016 per ton is due to a change in the amortization rate.

**30. Taxes**

This decrease of .036 is due to the increase in production.

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9. EXPLORATIONS  
AND FUTURE  
EXPLORATIONS

There was no exploration work done as such during 1939 and there is none contemplated for the coming year. The item of \$189.11 charged to this account during the current year was the cost of the last drill hole on the West end of the East Pit which was not blasted due to the fact that the material encountered was very lean. This hole now marks the Westerly boundary of the merchantable reserves in the East Pit.

10. TAXES

<u>Tilden Township</u> <u>Tilden Mine</u>	<u>1939</u>		<u>1938</u>	
	<u>Valuation</u>	<u>Taxes</u>	<u>Valuation</u>	<u>Taxes</u>
N $\frac{1}{2}$ of Section 26, 47-27.....	\$290,000	\$6,128.02	\$270,000	\$5,890.16
Personal Supplies & Equipment.....	75,000	1,584.83	50,000	1,090.77
Total.....	<u>\$365,000</u>	<u>\$7,712.85</u>	<u>\$320,000</u>	<u>\$6,980.93</u>
Collection Fees.....		77.13		69.81
Total Tilden Mine.....		<u>\$7,789.98</u>		<u>\$7,050.74</u>

11. PERSONAL INJURY

There were no lost time accidents at the Tilden Mine during 1939.

12. NEW CONSTRUCTION  
AND PROPOSED  
NEW CONSTRUCTION

The new construction during 1939 included the completion of the road and approach from the Lower Bench to the Crusher Building under E. & A. No. 786. All of the construction work under this E. & A. is now completed with the exception of the surfacing of the road with crushed rock. To date the surface obtained by compacting the earth fill has been fairly satisfactory although it may be advisable sometime in the future to add additional material.

A large repair and storage shed of frame and galvanized sheet construction was built to house the new tractor and wagon at the following expense:

Supplies - - - - -	\$ 630.42
Labor - - - - -	444.29
Total - - - - -	<u>\$1,074.71</u>

A small fire hose shed was constructed at a cost of \$48.95.

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13. EQUIPMENT  
AND PROPOSED  
NEW EQUIPMENT

a. Shovels and Crushers

The three electric shovels operated throughout the season with only one breakdown of consequence. This consisted of the failure of the boom and dipper handle on No. 31 shovel and occasioned considerable expense for repairs. Due to the relatively light loading schedule the amount of repairs on this equipment remaining to be done at the end of the year was comparatively small.

Two large maintenance jobs were necessary on the crushing plant, the first of which was the replacement of a broken main frame on the West 10" gyratory. This was obtained from a similar crusher at the old Empire Mine. The second large maintenance job was the installation of a new set of concaves in the 42" primary crusher which necessitated 41 man shifts. This work was completed at a cost of \$796.64 for supplies, \$234.56 for labor, a total of \$1,031.20.

The new clean air blower which was purchased for the crushing plant in 1938 worked satisfactorily throughout the year as did the ventilating fan and dust filter, which were installed in 1937.

b. Drills and Equipment

The 29-T 9" churn drills continued to work satisfactorily with one minor exception which was the failure of a clutch. This clutch, which is interchangeable for either side of either machine, was replaced with a new one and was repaired to be held in reserve as a spare.

c. Haulage Equipment

New haulage equipment for transporting the ore up the incline from the Lower Bench to the crusher was purchased and delivered early in May. This equipment consists of a D-8 Caterpillar tractor, Diesel powered; an Athey crawler-wagon, capacity 13 cubic yards or 20 short tons; and a LaPlant-Choate hydraulically operated Trail-Builder. This equipment was purchased under E. & A. No. 810 at the following cost:

D-8 Tractor.....	\$ 6,415.15
Athey crawler-wagon.....	4,379.74
Trail-builder.....	2,168.11
Total.....	<u>\$12,963.00</u>
Fuel Tank.....	68.20
Cost of mounting tank.....	48.81
Grand Total.....	<u>\$13,080.01</u>

The cost of this equipment is being depreciated at the rate of \$2,592.60 per year and during 1939 was charged out in five equal installments of \$518.52 per month from June to October, inclusive. The depreciation charges were allocated on a pro-rated basis against the different jobs performed by the equipment.

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13. EQUIPMENT  
AND PROPOSED  
NEW EQUIPMENT (CONT.)

c. Haulage Equipment (Cont.)

The following is a recapitulation of the numerous tasks performed by this equipment during the year, some of which have already been discussed under Stripping and Loading:

	<u>Days</u>	<u>Labor</u>	<u>Supplies</u>	<u>Depreciation</u>	<u>Total</u>	
Hauling ore from						
Lower Bench.....	52	\$ 332.08	\$ 210.52	\$ 1,584.09	\$ 2,126.09	(1)
Hauling rock.....	14	84.00	55.75	198.61	338.36	(2)
Track Expense.....	1	6.00	4.56	-	10.56	
Hauling Tamping East Pit	$\frac{1}{8}$	3.00	1.99	14.39	19.38	
Drill Roads.....	4	24.00	11.69	79.85	115.54	
General Pit roads.....	6	36.00	12.74	-	48.74	
Stripping North side						
of East Pit.....	31 $\frac{1}{2}$	189.00	116.84	267.08	572.92	(3)
Stripping West Half of						
West Pit.....	10	60.00	36.18	264.58	360.76	(4)
Stripping Lower Bench...	5 $\frac{1}{2}$	33.00	17.40	-	50.40	(5)
Charged to E. & A. #786..				184.00	184.00	
Stripping South side						
of East Pit.....	3	18.00	7.11	-	25.11	(6)
Total Operating.....	127 $\frac{1}{2}$	\$ 785.08	\$ 474.78	\$ 2,592.60	\$ 3,851.86	
Tractor Maintenance*....	3	18.00	52.66		70.66	
Total, Operating and Maintenance.....	130 $\frac{1}{2}$	\$ 803.08	\$ 527.44	\$ 2,592.60	\$ 3,922.52	

\* - New cutting edge on bull-dozer and valve assembly.

- (1) - 38,269 tons at 5.56¢ per ton.  
 (2) - 4,433 cubic yards at 7.64¢ per yd.  
 (3) - 7,000 " " " 8.13¢ " "  
 (4) - 1,500 " " " 24.00¢ " "  
 (5) - 1,100 " " " 4.60¢ " "  
 (6) - 600 " " " 4.2¢ " "

The yearly depreciation of \$2,592.60 was charged out in five equal installments of \$518.52 from May to September, inclusive.

14. MAINTENANCE  
AND REPAIRS

The maintenance and repair work during the operating season have already been discussed under Paragraph 13, labeled Equipment. The cost of winter and idle expense has been listed under 8b4, Open Pit Costs.

The amount of winter and idle expense for the current year was extremely small, being slightly in excess of \$15,000 as compared with amounts varying from \$23,000 to \$30,000 annually during the last three years. Repairs under the Idle and Winter expense account were begun on November 20th, immediately after

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14. MAINTENANCE  
AND REPAIRS (CONT.)

the completion of the loading schedule. Repair work on the shovels was started on December 1st. At the end of the year approximately half of the necessary work had been completed.

The Cletrac tractor which is in rather poor state of repair, was sent to the General Shops for complete inspection and possible overhauling.

Early in 1940, a man from the Brebner-Sinz Machinery Company of Marquette will be called in to inspect the new Caterpillar tractor and associated equipment. In spite of the large amount of work done by this machine there will probably be very little repair work necessary.

15. POWER

Electric power has been entirely satisfactory since the installation of the new mine sub-station and transformer. The slight delays attributed to this cause during 1939 were due to the advisability of shutting down the crushers temporarily during severe electrical storms to avoid the possibility of the circuit breaker throwing out while the crushers were under load.

16. WATER SUPPLY

The water supply was satisfactory during the year, being ample for general mine use as well as the washing which was done in the West Pit. A small pump was installed on the casing pipe of Diamond Drill Hole No. 51 from which drinking water was pumped to the office and shops and high pressure water to the spray nozzles in the dust-collecting house East of the crusher building.

All secondary drilling with both jack-hammers and tripod drifter drills was done wet, water pressure being obtained by placing the supply tanks on the high faces of both pits. Water from these tanks was also used for primary churn drilling.

18. NATIONALITY  
OF  
EMPLOYEES

	<u>American</u> <u>Born</u>	<u>Foreign</u> <u>Born</u>	<u>Total</u>
English.....	7	4	11
Swedish.....	7	-	7
Finnish.....	6	2	8
Irish.....	4	-	4
Total.....	24	6	30

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For purposes of record, the following remarks are included on the repair work during the month of December, 1939:

Crushers

42" Primary: The eccentric was inspected and replaced. New bearings were installed on the drive shaft. The motor was cleaned.

10" Secondary Crushers: The eccentrics on both crushers were inspected and replaced. New bearings were installed on the drive shafts of both crushers. A new pinion gear was installed on the drive shaft of the East crusher. Both motors were dismantled preparatory to cleaning.

Conveyor

The conveyor belt was removed and stored for the winter.

Pocket

One new chute was installed and the others were repaired.

Electric Shovels

Repairs on No. 31 shovel were started on December 1st. The drive sprocket bearings were rebabbitted. Three new caterpillar links were installed. The dipper and boom were repaired. The revolving rails and center casting were tightened.

Locomotives

The tenders on Nos. 2 and 3 were repaired. The air brake equipment on Nos. 1, 2 and 4 were repaired.

Miscellaneous

Erection of the D-8 tractor repair shed and garage was completed. The lighting and heating systems were installed. The property as a whole was given a general clean-up and the roads were graded with the D-8 tractor and Trail-Builder. The Cletrac tractor was sent to the General Shops.

ATHENS MINE  
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1. GENERAL:

The Athens Mine operated on a three day schedule per week for each employee from January 1st to January 9th, then on a four day schedule to June 12th and from June 12th to September 11th on a four day schedule. The staggered working schedule whereby the mine worked one more day than the men was in effect until September 11th at which time it was eliminated. A five day schedule per week for each employee was in effect from September 11th to the end of the year. The staggered working schedule was adopted on December 6th, 1937 and was in effect until September 11th, 1939. The opening of the 7th and 9th levels made sufficient working places available to add more contracts and increase production. The five day two shift operation per week with a small hoisting crew on the third shift gave each employee forty hours per week and Saturday free for repair work in the mine and the shaft. The repair crews that work on Saturday start the weeks work on Tuesday.

The product of 404,877 tons in 1939 has only been exceeded once in the history of the mine. In 1937 the product was 443,098 tons, of which 7,354 tons was overrun credited to the hoist for the year while in 1939 there was no overrun due to ore left in stockpiles. In 1937 the mine was on a 3-8-hr. shift schedule with a half crew on each shift and for nearly six months worked six days per week. In 1939 the mine operated on a 2-8-hr. shift schedule throughout the year with the maximum of five days per week for the last three and one-half months of the year with practically full crews on each shift.

Shipments in 1939 were 457,339 tons and were only exceeded in 1929 and 1937 in which years 485,940 tons and 476,038 tons respectively were shipped.

Pressure on the 6th level haulage drifts and raises in the areas mined was quite severe during the year but somewhat less than in the previous year. The retimbered sections of the drifts last longer in some areas than formerly, while in others there does not seem to be much improvement. Mining is being rushed in the areas showing the heaviest pressure and a further decrease in pressure is expected in 1940.

The safety record improved in 1939 and the Athens ranked above the average of the Company's mines. The mining hazards are greater at the Athens than in some of the other of the Company's mines which makes the men more careful and the bosses more active in safety work.

2. PRODUCTION?  
SHIPMENTS &  
INVENTORIES:

a. Production by Grades:

	<u>1939</u>	<u>1938</u>	<u>Increase</u>
Athens Ore	243,256	165,949	77,307
Mitchell Lease Ore	<u>161,621</u>	<u>102,101</u>	<u>59,520</u>
Total Ore	404,877	268,050	136,827
Rock	<u>11,348</u>	<u>8,760</u>	<u>2,588</u>
Total Hoist	416,225	276,810	139,415

The ore produced in 1939 increased 136,827 tons and was next to the largest hoist in the life of the mine.

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

b. Shipments:

<u>Grade of Ore</u>	<u>Pocket</u> <u>Tons</u>	<u>Stockpile</u> <u>Tons</u>	<u>Total</u> <u>Tons</u>	<u>Total</u> <u>1938</u>
Athens Ore	125,522	205,266	330,788	74,174
Mitchell Lease Ore	78,484	48,067	126,551	24,334
Total - 1939	204,006	253,333	457,339	
Total - 1938	64,573	33,935	98,508	
Increase	139,433	219,398	358,831	

Shipments increased 364% in 1939 and were 52,462 tons more than the product for the year.

c. Stockpile Inventories:

<u>Grade of Ore</u>	<u>Dec. 31, 1939</u>	<u>Dec. 31, 1938</u>	<u>Increase</u>	<u>Decrease</u>
Athens Ore	53,971	141,503		87,532
Mitchell Lease Ore	149,794	114,724	35,070	
Total	203,765	256,227		52,462

d. Division of Product by Levels:

The ore hoisted from the various levels was as follows:

	<u>1939</u>		<u>1938</u>	
	<u>Tons</u>	<u>%</u>	<u>Tons</u>	<u>%</u>
6th Level	185,037	45.7	195,608	73.0
7th Level	203,023	50.1	69,792	26.0
8th Level	1,536	.4		
9th Level	15,281	3.8	2,650	1.0
Total	404,877	100.0	268,050	100.0

The division of product by levels shows the transfer of ore from the 6th level to the 7th level due to completion of a number of 7th level raises in 1939.

e. Production by Months:

The production by months was as follows:

<u>Month</u>	<u>Athens</u>	<u>Mitchell</u>	<u>Total</u>	<u>Rock</u>
January	20,269	12,160	32,429	484
February	16,795	12,800	29,595	988
March	20,780	15,503	36,283	516
April	15,282	15,094	30,376	536
May	20,975	14,084	35,059	1,108
June	19,672	10,873	30,545	1,224
July	15,417	10,622	26,039	936
August	14,715	9,558	24,273	780
September	20,995	14,693	35,688	1,244
October	25,850	15,225	41,075	1,296
November	29,151	16,405	45,556	936
December	23,355	14,604	37,959	1,300
Total 1939	243,256	161,621	404,877	11,348
Total 1938	165,949	102,101	268,050	8,760
Increase	77,307	59,520	136,827	2,588

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

f. Ore Statement:

	<u>Athens</u>	<u>Mitchell</u>	<u>Total</u>	<u>Total 1938</u>
On Hand Jan. 1, 1939	141,503	114,724	256,227	86,685
Product for Year	243,256	161,621	404,877	268,050
Total	<u>384,759</u>	<u>276,345</u>	<u>661,104</u>	<u>354,735</u>
Shipments	330,788	126,551	457,339	98,508
Balance on Hand	53,971	149,794	203,765	256,227
Increase in Output	77,307	59,520	136,827	
Decrease in Ore on Hand	87,532		52,462	
Increase in Ore on Hand		35,070		

g. Delays:

There were a large number of men home on March 14th and 15th due to a severe snow storm but the mine operated both days with small crews.

On March 20th there was a 1-1/2 hr. delay caused by moisture getting into the circuit breaker of the top tram switch. There was no loss of product.

There was a 50 minute delay on the night shift on April 25th caused by the breaking of the top tram rope. There was no loss of product.

Emergency repairs to the valves on the Ingersoll-Rand compressor accounted for a 1-1/4 hr. delay on September 6th. No product was lost.

Some trouble developed with the butterfly in the shaft house on October 3rd and caused a 1-1/2 hr. delay. No product was lost.

Hoisting was interrupted for one hour on November 6th to permit cutting of the new skip rope which was put in service on November 4th.

A short circuit between the shunt field cables of the controller and skip hoist motor caused a 5 hr. delay on November 9th with a resultant loss of product of 500 tons.

There was a one hour delay on December 5th due to cutting of the new skip rope which was put on December 2nd. There was no loss of product.

h. Delays from Lack of Current:

A rain and sleet storm on January 5th caused a 1-1/2 hr. delay due to lack of current. Approximately 150 tons of product was lost.

The mine was idle 1-1/4 hrs. on the day shift and on the night shift of April 17th, and also two shifts on April 18th due to a severe sleet storm which broke down the transmission lines. The loss of product on April 17th was 130 tons on the day shift. The time lost on the afternoon shift of the 17th and that lost on the two shifts on the 18th was made up by working April 21st and 28th.

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3. ANALYSIS:a. Average Mine Analysis on Output:

<u>Grade</u>	<u>Tons</u>	<u>1939</u>			<u>Tons</u>	<u>1938</u>		
		<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>		<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>
Athens	243,256	61.08	.132	6.39	165,949	61.11	.134	6.80
Mitchell	161,621	61.20	.129	6.12	102,101	60.86	.131	6.77

b. Average Analysis on Straight Cargoes:

<u>Grade</u>	<u>Iron</u>	<u>Mine</u>		<u>Silica</u>	<u>Lake Erie</u>	
		<u>Phos.</u>			<u>Iron</u>	<u>Moisture</u>
Athens		None			None	
Mitchell		None			None	

c. High Sulphur Ore:

No high sulphur ore was encountered in mining during 1939.

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  
% of Bessemer - none

	<u>Athens Lots</u>	<u>Mitchell Lots</u>	<u>Corbit</u>	<u>Total Tons</u>
	<u>1, 7, 10, 12</u>	<u>8, 9, 11</u>	<u>Lot 13</u>	
4th Level and above	319,805	320,502	521,352	1,161,659
4th to 6th Level	792,469	1,037,676	11,626	1,841,771
6th to 7th Level	843,699	199,555		1,043,254
7th to 8th Level	649,825	9,647		659,472
8th to 9th Level	474,522			474,522
9th to 10th Level	423,922			423,922
Below 10th Level	60,784			60,784
Total Gross Tons	3,565,026	1,567,380	532,978	5,665,384
Less 10% Loss in Mining	356,503	156,738	53,298	566,539
	3,208,523	1,410,642	479,680	5,098,845
Less 10% for Rock	320,852	141,064	47,968	509,884
	2,887,671	1,269,578	431,712	4,588,961
Less December Production	23,355	14,604		37,959
Net Tons - 1939	2,864,316	1,254,974	431,712	4,551,002
Net Tons - 1938				4,825,092
Decrease				274,090

For the first time the estimated ore on each level is reported in gross tons and 10% for loss in mining and 10% for rock is deducted from the total gross ore instead of being deducted from the gross tons on each level. The total estimated ore is 274,090 tons less than in the previous year. Deducting the actual decrease from the product shows that 130,787 tons were developed in 1939. The increase occurred mainly in the ore between the 6th and 7th level areas and in the ore between the 8th and 9th level. The increase was due to the ore extending to the West under the hanging beyond the limits previously estimated and to the South footwall dipping at a steeper angle than had been assumed.

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

b. Prospective Ore:

All ore in the mine is developed.

c. Estimated Analysis:

Ore Reserves: Approximate Expected 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>
4,551,002	53.00	.118	6.20	.400	2.75	.62	.73	.010	1.40	13.00

Ore in Stock: Average Natural Analysis:

Athens 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>
53,971	53.45	.117	5.96	.44	2.32	.62	.73	.009	1.14	11.93

Mitchell Lease 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>
149,794	53.36	.113	5.54	.41	2.31	.61	.73	.009	1.14	12.30

5. LABOR  
AND  
WAGES:

a. Comments:

The average number of employees in 1939 was 326, in 1938, 327. There were more men producing ore in 1939 and less men on repair work. There was some dissatisfaction on the two day schedule but since the five day per week operation the men are content as they are earning good wages. The men think the 40 hour week is the best possible operating schedule from their viewpoint with which opinion there is agreement by the Company.

b. Comparative Statement of Wages and Product:

	<u>1939</u>	<u>1938</u>	<u>Increase</u>	<u>Decrease</u>
PRODUCT	404,877	268,050	136,827	
No. Shifts and Hours	1-8 5	1-8 3	1-8 2	
	2-8 240	2-8 198	2-8 42	
	3-8 -	3-8 4		3-8 4
<u>AVERAGE NO. MEN WORKING:</u>				
Surface	59	67		8
Underground	267	260	7	
Total	326	327		1

Decrease in number of surface men mainly due to showing General Shop labor on Labor Statement in 1938.

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5. LABOR  
AND  
WAGES: (Cont'd)

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

	<u>1939</u>	<u>1938</u>	<u>Increase</u>	<u>Decrease</u>
<u>AVERAGE WAGES PER DAY:</u>				
Surface	5.51	5.48	.03	
Underground	<u>6.34</u>	<u>6.23</u>	<u>.11</u>	
Total	6.18	6.06	.12	
<u>AVERAGE WAGES PER MONTH:</u> (Based on Mine Payroll Including Captain & Clerks)				
Surface	104.24	85.98	18.26	
Underground	<u>110.93</u>	<u>84.24</u>	<u>26.69</u>	
Total	109.72	84.60	25.12	
<u>PRODUCT PER MAN PER DAY:</u>				
Surface	30.20	21.26	8.94	
Underground	7.22	6.35	.87	
Total	<u>5.83</u>	<u>4.89</u>	<u>.94</u>	
<u>LABOR COST PER TON:</u>				
Surface	.132	.258		.076
Underground	<u>.878</u>	<u>.980</u>		<u>.102</u>
Total	1.060	1.238		.178
<u>AVERAGE PRODUCT MINING:</u>				
Stopping	21.25	20.70	.55	
Ore Development	<u>12.55</u>	<u>11.82</u>	<u>.73</u>	
Total	21.03	19.98	1.05	
AVERAGE WAGES CONTRACT LABOR	7.21	7.06	.15	
<u>TOTAL NUMBER OF DAYS:</u>				
Surface	13,405	12,606	799	
Underground	<u>56,079</u>	<u>42,202</u>	<u>13,877</u>	
Total	69,484	54,808	14,676	
<u>AMOUNT FOR LABOR:</u>				
Surface	73,799.05	69,129.29	4,669.76	
Underground	<u>355,405.99</u>	<u>262,840.46</u>	<u>92,565.53</u>	
Total	429,205.04	331,969.75	97,235.29	
<u>AVERAGE WAGES PER MONTH AS PER LABOR STATEMENT - LESS CAPTAIN AND CLERKS:</u>				
Surface	101.24	82.84	18.40	
Underground	<u>110.33</u>	<u>83.65</u>	<u>26.73</u>	
Total	108.79	83.49	25.30	

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5. LABOR  
AND  
WAGES: (Cont'd)

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

Proportion of Surface to Underground Men:

1939 - 1 to 4.525

2-8-hr. shifts 5 day and afternoon shifts 1/1 to 6/12.  
2-8-hr. shifts 4 day and afternoon shifts 6/12 to 9/11.  
2-8-hr. shifts 5 day and afternoon shifts 9/11 to 12/31.

Crews worked on a staggered schedule and men received one shift less than the number of days the mine operated up to Sept. 11th.

1938 - 1 to 3.88

2-8-hr. shifts 6 day and afternoon shifts 1/1 to 2/28.  
2-8-hr. shifts 5 day and afternoon shifts 2/28 to 4/18.  
2-8-hr. shifts 4 day and afternoon shifts 4/18 to 6/1.  
2-8-hr. shifts 3 day and afternoon shifts 6/1 to 11/1.  
2-8-hr. shifts 4 day and afternoon shifts 11/1 to 12/31.

Crews worked on a staggered schedule and men received one shift less than the number of days the mine operated.

c. Operating Schedules - 1939:

<u>Month</u>	<u>Days Mine Worked Per Week</u>	<u>Days Per Month</u>	<u>Days Men Worked Per Week</u>	<u>Avg. Shifts Worked Per Month by Each Man</u>
January	5 days and afternoons	21	4	17
February	5 days and afternoons	20	4	16
March	5 days and afternoons	23	4	18
April	5 days and afternoons	20	4	16
May	5 days and afternoons	23	4	18
June	5 days & afternoons to 6/12		4	
	4 days & afternoons from 6/12	19	3	14
July	4 days and afternoons	17	3	13
August	4 days and afternoons	18	3	12
September	4 days & afternoons to 9/11		3	
	5 days & afternoons from 9/11	19	5	18
October	5 days and afternoons	22	5	22
November	5 days and afternoons	22	5	22
December	5 days and afternoons	21	5	20

Average for year mine operated 20 days per month  
Average for year worked by each man 17 shifts per month

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6. SURFACE:

a-1. Buildings:

The drive sheave on the rock tram engine was located outside of the engine house and in severe snow storms would be covered with snow. An addition was built on the side of the rock tram engine house to enclose the sheave.

The sheet iron covering and a portion of the frame of the timber tunnel was in need of repairs and repair work was started in August. A section about 200 ft. in length leading from the concrete section near the shaft to the West towards the timber yard was repaired and painted. The balance of the sheet iron enclosed tunnel will be repaired and painted in 1940.

The wood platform at the top of the shaft house used every day when oiling the head sheaves rotted and became dangerous. It was replaced with a new three inch fir floor.

The shaft house loading pockets were overhauled in the Spring before shipping started. Several new plates were installed and the front of one pocket lined with rails. New plates were also installed on the butterfly chute closer.

a-2. Docks, Trestles and Pockets:

The Athens ore stocked under the wood trestle erected in 1938 at the end of the Southeast steel trestle was loaded in 1939 except for a rill directly under the trestle. Due to care exercised by the shovel operator and craner and good luck in regard to caves of ore while loading, only one 52 ft. leg was broken. This leg was replaced and ore will be stocked from this trestle in the Winter of 1939-1940.

Some of the 4-1/2 ft. ties on the Southeast steel trestle rotted and would no longer hold a track spike. These ties were replaced in August and September on both tracks on the trestle on the days the mine was idle.

The rock hoisted at the Athens Mine is stocked by a side dumping car from tracks laid directly on the rock pile as the original wood stocking trestle was filled many years ago. This arrangement makes it necessary to block the tracks and keep them level to prevent the side dumping rock tram car from jumping the track. In the Spring when the pile thaws it is necessary to block very carefully due to settlement of the rock dumped during the Winter. Extra expense is incurred in May and June every year in this work.

In 1938 the idler sheaves for one skip rope on the pulley stands from the engine house to the shaft house, five in number, were replaced with rubber lined sheaves designed by Mr. O. D. McClure, Chief Mechanical Engineer. They were a big improvement over the cast iron sheaves formerly in use and in 1939 the sheaves carrying the other skip rope were replaced with similiar rubber lined sheaves.

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6. SURFACE: (Cont'd)

a-2. Docks, Trestles and Pockets: (Cont'd)

The increased tonnage hoisted by the skip ropes in 1939 was undoubtedly due in a large measure, to the rubber lined sheaves. The extra cost of the sheaves will be repaid within a year. The only criticism of these rubber lined sheaves is the weight, which is about 200 lbs. each. It is hoped that a lighter weight rubber lined sheave will be available shortly. The 200 lb. sheave is difficult to handle at the top of the 80 ft. to 100 ft. pulley stands.

b. Stockpiles:

All of the Athens ore in stock, except a small rill directly under the trestle, was loaded in 1939, assuring ample stocking capacity for this grade this Winter. Shipments of Mitchell ore from stockpile were only 48,000 tons but as the Northeast steel trestle from which this ore is stocked was not filled to capacity, there will be sufficient stocking room available provided shipping starts by May 1st.

c. Timber Treating Plant:

In April when the frost came out of the ground, a settlement of the ground near the cave to surface occurred and a crack appeared across the West end of the timber yard. The ground settled about 18" and the West concrete tank for treating timber cracked near the East wall. The steel tank which rested on the concrete tank settled 18" at the West end but did not break or spring a leak. The steel tank was not strong enough to be lifted and leveled while filled with the Zinc solution. The solution was pumped out and stored in the old vertical steel tanks nearby, the steel tank leveled and the space below filled with sand after which the solution was pumped back again.

Treatment of the peeled and framed timber on hand that had been decked to dry out during the Winter, as also some that was framed and peeled in the Spring of 1939, was started in May and completed in June. In addition to the 625 - 9 ft. legs and caps treated, 269 - 4-1/2 ft. ties were treated for the Negaunee Mine. In the fall when the Lucky Star shaft of the Jones & Laughlin Steel Company was being repaired, the shaft timber and plank used in this work were treated at the Athens. All of the expense was charged direct to the Lucky Star job and does not appear in the cost data that follows.

	<u>Cost Per Ft.</u> <u>1939</u>	<u>Cost Per Ft.</u> <u>1938</u>	<u>Cost Per Ft.</u> <u>1937</u>
Peeling	.0485	.0447	.0466
Treating	.03 60	.0448	.0501
Decking	.0216*	.0047	.0060
Chromated Zinc Chloride	.0298	.0140	.0214
Heat, Water, etc.	.0138	.0133	.0136
Total	<u>.1497</u>	<u>.1215</u>	<u>.1377</u>
Maintenance Cost	.0116	.0088	.0066
Grand Total	<u>.1613</u>	<u>.1303</u>	<u>.1443</u>

(\*) Charge for decking high due to moving timber away from caved area.

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6. SURFACE: (Cont'd)

c. Timber Treating Plant: (Cont'd)

The cost per foot for treating timber in 1939 was higher than in 1938 due to higher maintenance cost due to settlement of ground, to higher decking cost due to moving the new and old stock of treated timber 200 ft. from the caving ground and to the use of more Chromated Zinc Chloride. More Zinc solution was required due to greater absorption account of the timber being more thoroughly dried. The stock of treated timber on hand is the lowest for many years and it will be necessary to treat more timber than usual in 1940. A new site must soon be provided for the treatment plant due to the caving ground involving the present site. The plant can be used in 1940 but must be moved to a new location next Fall.

<u>Year</u>	<u>No. of Pcs. Hardwood Stull Timber Treated</u>	<u>No. of Ft. Treated</u>
1939	625	5,641
1938	603	5,285
Increase	22	356

	<u>1939</u>	<u>1938</u>	<u>Inc.</u>	<u>Dec.</u>
No. Pcs. Used at Athens	656	648	8	
No. Pcs. Shipped to Maas, Negaunee & Gard.-Mack.	307	338		31
Total Pcs. Used & Shipped	963	986		23

	<u>Treated Timber On Hand 12/31/39</u>	<u>Peeled Untreated Timber On Hand 12/31/39</u>
9 ft. Pcs.	148	-
8 ft. Pcs.	-	-
Total	148	-
On Hand 12/31/38	483	-
Decrease	335	-

d. Water Purchased for Heating, Cooling, Etc.:

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

	<u>1939</u>		<u>1938</u>		<u>1937</u>	
	<u>Gallons</u>	<u>Amount</u>	<u>Gallons</u>	<u>Amount</u>	<u>Gallons</u>	<u>Amount</u>
1st Quarter	1,351,000	105.80	1,945,000	140.31	1,689,000	128.87
2nd Quarter	874,000	71.42	1,846,000	141.29	1,502,000	115.64
3rd Quarter	2,093,000	157.28	2,257,000	169.64	3,214,000	236.17
4th Quarter	3,461,000	252.92	1,981,000	149.63	1,799,000	136.23
Total	7,779,000	587.42	8,029,000	600.87	8,204,000	616.91
Product - Tons	404,877		268,050		443,098	
Cost Per Ton	.001451		.002242		.001392	

The cost for city water was slightly lower in 1939 due to less water used for watering lawns and shrubbery in the Summer and less used in the mine account of less drifting and raising in rock.

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6. SURFACE: (Cont'd)

e. Grounds:

The heavy ice and sleet storm in April broke many branches on the Lombardy Poplar trees and the shrubbery at the mine, entailing extra expense for cleaning the grounds after the storm. The grounds around the mine were kept in good condition during the year. Fertilizer was used on the lawn and the shrubbery. The tall shrubbery around the mine buildings was pruned severely as it cut off the light.

The automobile parking grounds across the street from the mine was fenced on three sides in 1938. The barbed wire fence was cut several times last Summer and gasoline stolen at night from the parked cars. The fence was reinforced with heavy woven wire fencing used to cover the floors of sub levels in the mine. The City of Negaunee added one light in the parking area and stealing of gasoline stopped. The unused portion of the parking ground was leveled with cinders and gravel in the Fall as the number of cars in use by employees is constantly increasing. To prevent grease blowing, in strong South winds, on the cars from the skip ropes as they pass over the sheaves on the pulley stands, it is recommended that Lombardy Poplars be planted on the South or street side of the parking lot. A close plantation, except at the two drive-in roads, would materially reduce the damage to the finish of the cars and annoyance of cleaning wind shield and car windows.

Due to settlement of ground around the cave to surface, which on the North side extended to the face of the diorite hill, it was necessary to move the fences enclosing the cave.

f. Cooling Pond:

The cooling pond on the hill near the engine house that was built when the mine opened, proved to be too small and also developed some leaks. To keep the cooling water used by the compressors at the proper temperature during the Summer, it was necessary to use City water and allow the excess to overflow from the pond. A new pond was constructed outside of the old pond in the Fall, that doubled the capacity and after completion the walls of the old pond were removed, a new floor laid, and the new tank put in commission. Some leveling and seeding of the ground around the new tank remains to be done next Spring to complete the job.

7. UNDERGROUND:

a. Shaft Sinking:

There was no shaft sinking in 1939.

b. Development:

The major portion of the development work in 1939, as in the previous year, was confined to the 7th and 9th levels. During the year drifting on the 9th level was nearly finished as the last cross-cut to the South has only to advance approximately 100 ft. to completion. Five raises from the 9th level to subs above the 8th level elevation have been completed with two more going up at the end of the year. On the 7th level three raises were put up in No. 2 cross-cut to the sub levels above the 6th level. The balance of development work was mainly confined to drifts and raises driven on sub levels for airways to improve ventilation. Development work in rock and ore decreased in 1939 as compared with the previous year.

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7. UNDERGROUND: (Cont'd)

b-1. Development in Rock:

The following is a summary of the development work in rock during 1939:

-500' Sub

Eight feet of drift was advanced through jasper when driving the connecting drift from No. 610 raise to No. 611 raise for a ventilation and traveling road.

-515' Sub

Twenty-two feet of drift was advanced through fault dike for a ventilation connection to a drift on the North side of the dike.

6th Level

Eighteen feet of drift was advanced in slate and jasper for a ventilation connection to No. 1 cross-cut near No. 616 raise.

-620' Sub

Seventy-seven feet of drift was advanced through slate and jasper and twenty-two feet of rock raise to the 6th level elevation for a ventilation connection.

7th Level

Three additional raises were put up from No. 2 cross-cut on the 7th level. No. 725 raise advanced through 35 ft. of slate and dike before encountering the ore. No. 723 raise advanced 44 ft. in slate and dike to the ore. No. 720\* raise was in ore for its total length. The total rock raising on the 7th level was 79 ft.

(\* Detail of this raise under "Development in Ore".

9th Level

The main level drift, and cross-cut and drift to the Southwest advanced a total of 473 ft. in jasper and slate.

A total of five raises were completed from the 9th level, two of which advanced through footwall material before encountering ore. Two additional raises were being put up at the end of the year.

No. 930 raise advanced through 46 ft. of slate and jasper to the ore.

No. 934 raise advanced through 32 ft. of slate and jasper to the ore.

No. 932 raise advanced through 13 ft. of slate and jasper by the end of the year.

No. 933 raise advanced through 17 ft. of slate and jasper by the end of the year.

There was a total of 473 ft. of rock drifting and 108 ft. of rock raising on the 9th level.

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7. UNDERGROUND: (Cont'd)

b-1. Development in Rock: (Cont'd)

The following is a summary of the development footage for 1939:

	<u>Drifting</u>	<u>Raising</u>	<u>Total</u>
-500' Sub	8'		8'
-515' Sub	22'		22'
6th Level	18'		18'
-620' Sub	77'	22'	99'
7th Level		79'	79'
9th Level	473'	108'	581'
Total - 1939	598'	209'	807'
Total - 1938			966'
Decrease			159'

b-2. Development in Ore:

Ore development during the year was 33% less than in the previous year and was confined to the 7th, 8th, and 9th levels. A summary of the work follows:

7th Level

Two raises put up from No. 2 cross-cut encountered the ore after advancing through the footwall slate and jasper while one raise was entirely in ore.

No. 725 raise was started in the footwall and encountered ore at a height of 40 ft. and advanced 105 ft. in ore to a total height of 145 ft. - Completed.

No. 723 raise was started in the footwall, encountered ore at a height of 54 ft. and advanced 101 ft. in ore to a height of 155 ft. - Completed.

No. 720 raise was cut out on the level in ore and advanced 137 ft. in ore to a height of 147 ft. - Completed in November.

The total ore raising on the 7th level in 1939 was 343 ft.

8th Level

About 8 ft. of ore raise was put up from the main level ore drift to provide a ventilation connection to the -780' sub level in block 2 where mining had been started on the -780' sub level.

9th Level

The main level ore drift to the Southwest advanced 67 ft. in ore to completion. The first cross-cut to the Southwest encountered only 28 ft. of ore around the curve.

No. 902 raise was started late in 1938 and advanced 122 ft. in ore to a height of 139 ft. above the level. - Completed.

No. 904 raise advanced 115 ft. in ore to a height of 125 ft. above the level. - Completed.

No. 906 raise advanced 123 ft. in ore to a height of 133 ft. above the level. - Completed.

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7. UNDERGROUND: (Cont'd)

b-2. Development in Ore: (Cont'd)

No. 930 raise advanced to a height of 56 ft. in footwall slate and 83 ft. in ore to a height of 139 ft. above the level. - Completed in December.

No. 934 raise advanced to a height of 42 ft. in footwall slate and 100 ft. in ore to a height of 142 ft. - Completed in December.

The total ore development on the 9th level was 95 ft. of drifting and 543 ft. of raising.

The following is a summary of the development footage in ore during 1939:

	<u>Drifting</u>	<u>Raising</u>	<u>Total</u>
7th Level		343'	343'
8th Level		8'	8'
9th Level	95'	543'	638'
Total - 1939	95'	894'	989'
Total - 1938			<u>1478'</u>
Decrease			489'

c. Stoping:

(1) General:

The product in 1939 was mainly obtained from mining in block 3 and the West half of block 4 above the 6th and 7th levels. A small amount of ore was obtained from mining in block 2 above the 9th level.

Mining in block 3 on the North side of the fault dike is now under way on the second and third subs below the 6th level. Mining in this block South of the fault dike was under way from 6th and 7th level raises for most of the year, but at the end was entirely handled through 7th level raises. Mining was well advanced on the -665' or second sub above the 6th level and was started at one raise on the -675' or first sub above the 6th level.

In the West half of block 4 above the 6th level in the small ore body North of the fault dike mining was continued during the year and had reached an elevation of 120 ft. above the level at the end of the year. South of the fault dike in the area adjacent to the dike directly above the drifts under excessive pressure on the 6th level mining was speeded up and two sub levels mined during the year. At the end of the year mining had reached an elevation of about 60 ft. above the level. Further South near the footwall in this same area one sub level was mined during the year and mining well advanced on another sub level 140 ft. above the 6th level. Late in the year mining was started in block 2 North of the fault dike on the second sub level above the 8th level from three raises put up from the 9th level.

The small ore area North of the fault dike in the West half of block 4 was mined on three sub levels during the year by two contracts.

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7. UNDERGROUND: (Cont'd)

c. Stoping: (Cont'd)

(1) General: (Cont'd)

The area directly South of the fault dike in the West half of block 4 was mined on three sub levels by four contracts. This area is three times the size of the area North of the dike.

The area near the South footwall in block 4 was mined on two sub levels in 1939 by four contracts. This area is 25% larger than the area directly South of the fault dike and four times as large as the area North of the fault dike.

The ore area in block 3 North of the fault dike was mined in 1939 on four sub levels by four contracts. Mining was nearly completed on one sub level the first of the year and just started on another at the end of the year so that actually only two sub levels were mined out.

In block 3 South of the fault dike mining in two separate steps were under way the first of the year. The lower step comprised an area directly South of the fault dike of approximately the same size as the area North of the dike. It was mined on two sub levels by two contracts. The balance of this area extended along the East limit of mining to the South footwall and was of about equal size on the sub level being mined in the early part of the year. At that time it was being mined from two raises from the 7th level and three raises from the 6th level by five contracts. The completion of three additional raises from the 7th level and the rapid extension of the ore area to the West under the hanging permitted the addition of another contract in this area and by the end of the year all of the ore was being handled in 7th level raises and all mining South of the fault dike was on the same elevation. Including the two contracts directly South of the dike, eight contracts were working here at the end of the year. The next lower sub level was being opened at the end of the year under the hanging from one 7th level raise.

In block 2 ore was mined on the second sub above the 8th level by three contracts from three raises from the 9th level. Development of this sub level started in October 1939.

Summarizing the above data shows mining was under way on sixteen sub levels in 1939, the same number as the previous year. At the end of the year mining was under way in blocks 2, 3, and the West half of block 4 in a total of six separate areas at different elevations.

(2) Detail of Stoping:

The six different areas being mined are reported separately as in previous years, starting with the three areas in the West half of block 4.

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7. UNDERGROUND: (Cont'd)

c. Stoping: (Cont'd)

(2) Detail of Stoping: (Cont'd)

North Side of Fault Dike - West Half of Block 4

Mining was continued in this small area by two contracts in 1939. There were several delays during the year while the contracts were off production repairing the raises. The last two pillars on the -450' sub were mined early in the year and the -460' sub then opened and mined. The -470' sub was opened late in the year and mining from the two raises was under way at the end of the year. This ore body is decreasing in size on each succeeding sub level due to the East footwall advancing more rapidly than the limit of mining on the West side recedes. Ventilation is provided by a drift on the -450' sub level elevation from No. 607 raise to a raise in the footwall that connects to the 4th level, the exhaust airway.

South Side of Fault Dike - West Half of Block 4 -  
Ore Directly South of Fault Dike

This sub level was opened from two raises in 1936, mining being started on the -440' sub level under the hanging. The ore area was small in size until late in 1938 when the hanging on the South side receded and mining from two raises in No. 1 cross-cut was started on the -500' sub level elevation. Prior to this time mining from a transfer raise on the -470' and -485' sub level elevations under the jasper at the North side of the ore body on the South footwall had indicated the early elimination of the jasper on lower sub levels. The area mined from the transfer raise was about 100 ft. South of the jasper on the hanging side of the ore body directly South of the fault dike. The dropper in the hanging between these two ore bodies was very irregular in outline as along the mined area in block 3 the ore bodies had nearly joined. The 500' sub level opened in 1938 and on which mining from the four raises was completed early in 1939 was the first sub level where the two ore bodies actually joined and the jasper disappeared in half of the area. The next sub level, the -515', was then opened and mining completed here in December 1939. The jasper persisted in one area near the East limit of mining, roughly 50' x 40' in size, while the entire area of the sub level was 170' x 180' in size. The -530' sub was opened in November 1939 and mining was underway with four contracts at the end of the year. It is thought that the jasper will practically disappear on this sub level. With the disappearance of the jasper and mining of the entire area the pressure on the 6th level drift and cross-cut below should soon decrease.

South Side of Fault Dike - West Half of Block 4 - Ore Body on South Footwall

This area was opened for mining in 1935 at the elevation of the 4th level, 200 ft. above the 6th level. At the end of 1938, mining had reached the elevation of the -440' sub level. In 1939 with four contracts working, mining on the -440' sub was finished and the -450' sub 80% mined at the end of the year. Two large and three small pillars remain to be mined on the -450' sub. One contract will move down in January and open the -460' sub level. There have been numerous delays to mining in this area during the year, due to transfer of mining gangs to repair raises. One raise, No. 614, has been completely recribbed in the upper 100 ft. section at least four times during the year. The other raises in this area have been completely recribbed once and small sections repaired several times. The ore is not allowed to accumulate in the raises as it hangs up and has to be blasted out. It is scraped to the raises only when motor cars are spotted

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7. UNDERGROUND: (Cont'd)

c. Stoping: (Cont'd)

(2) Detail of Stoping: (Cont'd)

at the chutes on the 6th level. This has also proved a hindrance to rapid mining in this area.

The hanging jasper disappeared on the -440' sub level and the ore extended to the mined area in block 3. The jasper on the Northwest side continues almost vertical so there has been no extension of the ore area on this side. Two subs below or on the -470' sub level, the hanging on this side flattens and the area to be mined on the South footwall will connect with the area already mined directly South of the fault dike. The slate footwall was encountered on the Southeast side on the -450' sub level before the slices reached the limit of mining with the result that the width of the ore is decreasing on each succeeding sub level. The decrease was about 30 ft. in width in a 60 ft. section at the Southeast corner of the area. The South footwall is dipping to the North and also decreases the ore area. The actual decrease in area on the -450' sub level was 3,000 sq. ft.

South Side of Fault Dike - Block 3 - Ore Body on South Footwall

Mining of this ore area was started at the elevation of the 4th level in 1935 and at the end of the year 1938 had reached the elevation of the -540' sub level. Mining on this sub level was completed early in 1939 and the -550' sub level opened and mined. The East part of the ore body was mined from 6th level raises on both of these sub levels and the West part from 7th level raises. On the -540' sub level three 7th level raises were in use. Due to the Westward extension of the ore under the hanging, seven raises from the 7th level and four above the 6th level were used to mine the ore on the -550' sub level. On this sub level the ore area decreased slightly in length from South to North and increased nearly 60 ft. in width from the East mining limit to the hanging. The hanging was quite irregular in outline with several droppers of jasper on the -550' sub level elevation. The -565' sub level was opened in the Fall and mining under the hanging nearly completed at the end of the year. About one-third the area has been mined. There was a further increase in the area on this sub level due to the ore extending further to the West under the hanging. Along the limit of mining of the ore body directly South of the fault dike the ore body on the South footwall has extended to the West to line up with the Southeast extension of the East side of the mined area in block 2. Mining of the area directly South of the fault dike and the ore body on the South footwall reached the same elevation on the -565' sub and will continue as a unit on lower sub levels. The hanging on the -565' sub has one inclusion of hanging 90' x 40' in area. On the South side of the -550' and -565' sub levels a small dike running due East and West has had to be removed to mine the ore between the dike and the slate footwall. The footwall has intersected the dike for a distance of 120 ft. at the Southeast corner of the ore area beyond which the ore extends 180 ft. on the South side of the small dike. The dip of the footwall to the North will soon cut out most of the ore that lies South of the small dike except at the extreme Southwest end where it had a width of 60 ft. on the -550' sub. On the -565' sub this same width was maintained due to advance of the ore to the West under the hanging. More ore has been developed along the South footwall than was anticipated and in the past two years has increased the estimated ore by nearly 200,000 tons.

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7. UNDERGROUND: (Cont'd)

c. Stoping: (Cont'd)

(2) Detail of Stoping: (Cont'd)

South Side of Fault Dike - Block 3

Mining of the -550' sub level by two contracts was under way all of the year 1938 and was completed early in 1939. Mining of this ore area was started in 1937 and was purposely slowed up in 1938 and 1939 in order that mining of the ore body on the South footwall might reach the same elevation. This was accomplished in 1939 on the -565' sub level elevation and from now on these two areas will be mined on the same elevation and considered as one area. Mining on the -565' sub level was completed in 1939 except for one large pillar along the fault dike. The ore in this area was mined from two 7th level raises in both 1938 and 1939. Since mining has reached the same elevation as on the South footwall ore area, several additional 7th level raises are available. Long slices can be mined from the 7th level raises and tons per man stoping from this area have been above the average for the mine.

North Side of Fault Dike - Block 3

Mining of this area during 1939 was under way with four contracts on four sub levels. Mining on the -575' sub level was 95% completed at the end of 1938 in the East half of the block and 90% completed in the West half of the block on the next lower sub level at the elevation of the 6th level. In 1939 mining was finished on the -575' sub level and the 6th level. In the East half of the ore body, the -600' sub level had been mined and mining started on the -620' sub level elevation while in the West half of the block mining was 85% completed on the -600' sub level. This ore body is being mined very rapidly due to unusually favorable conditions. The slices average 100 ft. in length in soft, dry ore and output stoping is over 30 tons per man per day as compared with an average of about 21 tons for the mine.

North Side of Fault Dike - Block 2

Mining in block 2 just above the 8th level elevation was started in October 1939 on completion of three raises from the 9th level. The area being mined extends across block 2 along the big diorite dike which is the North boundary of the ore body and to the South to a limit of mining. The ore is soft and mining conditions would be excellent except for water that interferes somewhat with scraping operations. When mining was under way above the 8th level in this area some years ago, water was encountered in several small areas and this condition has shown no improvement during the idle period. It has been possible however, to confine the water and carry it away in pipes so that thus far it has not proven difficult to control or a serious hindrance to handling the broken ore with scrapers.

Further South two raises have been completed from the 9th level and two others are being put up and within a few months mining of the balance of the ore North of the fault dike in block 2 will be started. Due to the Southerly pitch of the fault dike the ore area North of this dike is much larger on the 8th level than on the 6th level. The opening of this area for mining made it possible to estimate a product in 1940 in excess of 500,000 tons as it has provided working places for five or six additional contracts.

The work done on the 7th and 9th levels has been reported under "Development in Ore and Rock".

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7. UNDERGROUND: (Cont'd)

d. Timbering:

The total cost for timber lagging poles and wire netting increased \$ 11,233.58 or 31% and the cost per ton decreased 13%. The cost per foot for stulls, including cribbing timber, was 9% higher in 1939 due to less cribbing used, which, on account of its low cost per foot, has a marked influence on the total cost for timber. Actually the cost per foot for cribbing and all sizes of stulls was slightly lower per foot than in 1938.

Less timber was required per ton of ore, also less lagging, but more 9-1/2 ft. poles were used in covering down new areas under the hanging. More wire netting was used as extraordinary efforts were made to eliminate runs of loose jasper from the hanging. Relatively few runs occurred during the year and the grade of ore produced showed an improvement.

There was less timber used in repair work in 1939 due to decrease in pressure on the 6th level drifts and raises. However, the amount used is still a factor in the cost per ton for timber. The total cost for "Timbering" was \$ .481 per ton as compared with \$ .562 in 1938 or a decrease of 14.4%. If the repair work was eliminated the cost would not exceed \$ .350 per ton which shows clearly the extra expense entailed by the conditions existing in the mine. Pressure is decreasing and a further improvement is anticipated in 1940.

Statement of Timber Used:

	Lineal Feet	Avg. Price Per Foot	Amount 1939	Amount 1938
6" to 8" Cribbing	120,239	.0360	4326.93	5630.15
8" to 10" Stulls	21,225	.0679	1441.94	899.65
10" to 12" Stulls	83,515	.0942	7864.94	5854.81
12" to 14" Stulls	48,460	.1303	6318.29	4469.49
14" to 16" Stulls	14,113	.1525	2152.49	1627.67
Treated Timber	5,772	.3141	1813.00	1653.20
Total - 1939	293,324	.0815	23917.59	
Total - 1938				20134.97
Lagging - 7 ft.	973,781	.0081	7853.23	6614.14
Poles - 9-1/2 ft.	1,063,660	.0137	14568.94	9055.60
Total - 1939	2,037,441	.0110	22422.17	
Total - 1938				15669.74
Wire Fencing - Feet	14,190		814.07	115.56
Grand Total - 1939			47153.83	
Grand Total - 1938				35920.27

PRODUCT	1939	1938
Feet of Timber per Ton of Ore	404,877	268,050
Feet of Lagging per Ton of Ore	.7245	1.0058
Feet of Poles per Ton of Ore	2.4051	3.1282
Feet of Lagging per Ft. of Timber	2.6271	2.4579
Cost per Ton for Timber	3.3198	3.1101
Cost per Ton for Lagging	.0591	.0751
Cost per Ton for Poles	.0194	.0247
Cost per Ton for Wire Netting	.0360	.0338
Cost per Ton for Timber, Lagging, Poles, & Netting	.0019	.0004
Equivalent of Stull Timber to Board Measure	.1164	.1340
Ft. of Board Measure per Ton of Ore	556,379	379,823
Lin. Ft. of Netting per Ton of Ore	1.3741	1.4170
	.0350	.0067

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7. UNDERGROUND: (Cont'd)

d. Timbering: (Cont'd)

Total Cost for Timber, Lagging, Poles, etc.

<u>Year</u>	<u>Product</u>	<u>Amount</u>	<u>Cost Per Ton</u>
1939	404,877	47,153.83	.1164
1938	268,050	35,920.27	.1340
1937	443,098	49,763.66	.1123
1936	310,888	35,719.77	.1149
1935	192,534	22,585.11	.1173
1934	162,706	19,546.06	.1201
1933	147,368	11,372.50	.2401
1932	76,525	11,794.89	.1541
1931	251,580	28,704.68	.1141
1930	385,461	38,001.66	.0985

d-1. Repairing:

In order to give a clear picture of the extent of the repair work, a report of the work is included herewith as part of the Annual Report for 1939.

Due to the continuation of heavy pressure in portions of the 6th level haulage drift it was necessary to do a large amount of repair work during the past two years. In spite of constant repairing, some interruptions to mining have occurred when the raises into the mining areas crushed so badly that it was necessary to transfer the mining gangs to repair them. In some areas this has been necessary several times during the past two years. To eliminate these interruptions to mining as much as possible, several additional raises have been put up into the areas where heavy crushing occurs in order to speed up mining and thereby reduce the pressure.

In retimbering on the main levels, extra large size green timber has been used on account of its greater strength. Treated timber can not be used in heavy ground as it is not as strong due to drying prior to treatment. Breaking of the timber sets is mainly confined to the cap piece of the set. The legs, if not broken by either side or back pressure, are pushed into the floor of the drift and in time reduce the size of the drift so as to interfere with loading of cars. The back must then be raised to provide room to install regular 9 ft. timber. As a result of the timber legs being pushed into the floor of the drift the track is raised and must be lowered again by removal of ground from the floor. Care must be exercised when raising the back to prevent runs of the loose ground above the drift. Only experienced timbermen are employed at this work and even then the progress is quite slow due to the nature of the work.

In two raises that were put up in the crushing area in 1938, extra large size cribbing was used as an experiment. Using this type of cribbing from 12" to 14" in diameter, in a raise is quite unusual, the average size used being from 6" to 8". These raises lasted twice as long as the raises cribbed with 6" to 8" timber. In the raises which have crushed, as also in the main level drifts, it is quite often necessary to drill and blast out ground to provide room for installation of new timber.