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7. UNDERGROUND (Cont.)

c. Stoping

During the early months of the year by far the larger portion of mining operations was being carried on in the top slicing area in the Lloyd East Deposit above the 6th Level. There was also a small quantity of ore recovered by sub-level stoping and top slicing in the small South Deposit above the 6th. By the middle of the year development work on and above the 7th Level had opened up a comparatively large number of new working places so that mining operations were almost equally divided between the two levels. By the end of the year, although actual mining was still almost equally divided between the two levels, the larger portion was being trammed on the 7th due to the fact that new mining raises had been put through from that level to subs above the 6th.

Sub-level stoping operations above the 6th Level were not at all extensive since most of the deposits adaptable to this method of mining had been mined out prior to the beginning of the year. One small stope was operated in the South Deposit above two short transfer drifts on the 515' Sub-Level. Another small stope was worked for a short time above a transfer drift on the 490' Sub-Level northwest of Raise No. 681. A third stoping operation was carried on in the narrow deposit along the north footwall. For the most part this consisted of the recovery of small pillars lying beneath the old stope and above the new transfer drift on the 490' Sub-Level. A fourth small operation of this same type was carried on in a similar deposit along the north footwall from a transfer drift on the 490' Sub-Level north of Raise No. 630. At the end of the year a second transfer had been driven to the east of the raise in preparation for further mining.

Sub-level stoping accounted for the bulk of the recovery in the newly opened territory above the 7th Level. During the early months of the year tremendous quantities were recovered from No. 21 stope which extended from the transfer drift on the 360' Sub-Level to the 6th Level elevation of 470'. Later in the year, two other very successful stopes were developed and opened up in the extreme west end of the ore body along the transverse fault. The larger of these two was No. 8 which was in the crotch formed by the intersection of the north footwall and the transverse fault. The enrichment rose to a considerable height in this area. In addition to the large quantities of Lloyddale ore which were recovered from these stopes, a large proportion of the Siliceous product was obtained after the stopes began to cave. By the end of the year, No. 21 stope had been completed and top slicing operations were being started beneath it. No. 8 and No. 11 had been almost completed. Unfortunately, there are very few other areas in the known ore body which are adaptable to this method of mining. The lack of open stopes will be very noticeable in the production when there are no suitable areas available.

The following is a detailed review of the year's mining operations which were confined to sub-levels above the 6th and 7th Levels.

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7. UNDERGROUND (Cont.)

c. Stoping (Cont.)

SUBS ABOVE THE 6TH LEVEL

South Deposit

575', 565', 550', 525', and 500' Sub-Levels

Mining was continued throughout the early months of the year in the stope which had been developed during the latter part of 1941 above the transfer drift on the 515' Sub-Level. Operations in this area were never particularly successful due to the fact that the concentration was not at all uniform. Large masses of very lean jasper were encountered throughout the ore body. This condition not only made mining difficult and hazardous, but made proper grading almost impossible. Early in the year this small stope caved and completely filled the opening with very lean jasper and broken dike. Subsequent attempts to re-open to the west were not successful due to the very lean and spotty nature of the material. Top slicing operations were then started on the 550' Sub-Level immediately west of the caved stope but without any degree of success. Slicing operations were then moved to the 525' elevation from which a small quantity of ore was recovered. A second transfer was driven to the east of Raise No. 685 on the 515' Sub-Level. Two diamond drill holes and a short exploration drift were also driven at this elevation in an attempt to discover additional enrichment to the west. None of this exploration met with any success. Top slicing operations were then moved to the 500' Sub-Level beneath the mined-out area. The material encountered was still too lean and spotty to be properly mined. Toward the middle of the year extreme pressure in this area caused severe break-downs on the connecting drift on the 500' Sub-Level and on the main level below.

Lloyd East Deposit

575', 565', 550', and 540' Sub-Levels

Top slicing operations were completed on these sub-levels from the 600 raises early in the year. The mass of jasper, which was first encountered on the 565' Sub-Level became increasingly large as mining progressed downward. By the time mining had been completed on the 540' Sub-Level, this mass was occupying approximately 15% of the total slicing area.

525', 515', 500', and 490' Sub-Levels

A small amount of ore was recovered by sub-level stoping at these elevations above a transfer to the west of Raise No. 681 on the 490' Sub-Level.

Top slicing operations at the 630 raises were completed to the 490' Sub-Level by the latter part of the year and were being continued at lower elevations from raises above the 7th Level. Mining in the main slicing area at the 630 raises was completed in December on the 525' Sub-Level, and was well under way on the 515' Sub. At these elevations the mass of jasper and lean material

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7. UNDERGROUND (Cont.)

c. Stoping (Cont.)

Subs above the 6th Level (Cont.)

Lloyd East Deposit (Cont.)

525', 515', 500', and 490' Sub-Levels (Cont.)

had enlarged to approximately 25% of the area. A small amount of ore was recovered above the 525' Sub-Level from a transfer drift west of Raise No. 610. Small amounts of ore were recovered on the 500' and 490' Sub-Levels along the north footwall between Raises No. 601 and 603.

Top slicing operations above the 640 Cross-cut were completed early in the year and not continued until November when raises from the 7th Level were put through.

A short transfer drift was driven to the north of Raise No. 630 on the 490' Sub-Level above which a small quantity of ore was stoped. During December another transfer was driven to the east of the same raise and a number of mills put up to the sub-level above. Mining operations in No. 21 stope did not quite reach the 490' elevation since exploratory raises showed very lean jasper.

In the latter part of December, Raise No. 710 was put up to this elevation by Contract No. 4 in advance of top slicing operations.

480' Sub-Level

Late in the year, Raises Nos. 709, 711, 715, and 717 were completed to this elevation and top slicing operations begun in the area beneath the old stopes.

A small amount of Siliceous ore was recovered at this elevation by caving in No. 21 stope above the 7th Level.

6TH LEVEL

South Deposit

The pressure on the sub-levels above caused an extensive break-down in the main drift in the vicinity of Raise No. 683. Practically all important pieces of equipment were salvaged by means of a connecting drift south of the east drift to a point opposite Raise No. 685. All further attempts at mining this deposit were then abandoned due to the difficulties encountered and the poor grade of material. A second factor which had a bearing on this decision was the fact that operations in a large stope to the north were being postponed pending a completion of mining in this territory.

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7. UNDERGROUND (Cont.)

c. Stoping (Cont.)

6th Level (Cont.)

Mining operations in No. 21 stope above the 7th Level were quite extensive at this elevation with the material recovered being approximately half Lloyddale ore and half Siliceous ore. Top slicing operations were completed in the vicinity of Raise No. 742 after which a very successful stope was developed and opened in the seam of ore lying along the transverse fault. This stope eventually included the 680 Cross-cut. The only other operations on this level consisted of development work which has been previously described.

SUBS ABOVE THE 7TH LEVEL

465', 450', 440', 425', and 415' Sub-Levels

Mining operations on these sub-levels were entirely in sub-level stopes Nos. 21, 8, and 11. No. 21, which was originally opened by Contract No. 4, was operated from two different transfer elevations, one on the 415' Sub-Level and the other on the 365' Sub-Level. The transfer subs for stopes Nos. 8 and 11 were both on the 375' Sub-Level. Without these 3 very successful stopes, it would have been impossible to maintain anything like peak production. It was necessary to keep development crews constantly at work in advance of these operations since the enriched area was very irregular and had to be thoroughly developed well in advance of mining. Throughout the greater portion of the year two crews were kept busy in these stopes, one developing and the other mining. No. 21 stope was completed in the latter part of the year; No. 8 and No. 11 were being continued through December with considerable amounts of development and exploratory work still to be done.

On completion of mining in No. 21 stope several smaller stopes were opened up above the short slices on the 415' elevation where the deposit has pinched out to a very narrow seam. Satisfactory quantities of ore of both grades were recovered and in addition these operations served to provide filling for subsequent slicing operations below.

The intermediate sub-level drift at this elevation was previously described under the heading "Development".

Late in November, Raises No. 702 and No. 706 were completed to this elevation; the former in north footwall rock, the latter in ore. After completing the connecting drift between the two raises, a long transfer was started to the northeast in advance of a sub-level stope which will be developed in the crotch between the north and south footwalls under the old top slicing area.

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7. UNDERGROUND (Cont.)

c. Stoping, (Cont.)

Subs above the 7th Level (Cont.)

400', 390', and 375' Sub-Levels

Operations on these 3 sub-levels were largely in the 3 sub-level stopes previously described. For the most part the deposit was considerably wider and of better grade at these lower operations permitting the recovery of larger amounts of Lloyddale ore. By the end of the year top slicing operations under No. 21 stope had been well started in the vicinity of Raises Nos. 720, 703, and 705. Once again fairly large quantities of ore were recovered above the slices in small sub-level stopes.

In addition to the stope transfer drifts and the intermediate sub-level drift on the 375' Sub-Level which were previously described, top slicing operations had reached this elevation late in November. During December a connecting drift was driven between Raises Nos. 720, 703, and 705 and top slicing was well under way at Raise No. 720.

Mining operations throughout the whole territory above the 7th have been complicated by a discouraging lack of enrichment in certain areas. The material lying between Raise No. 703 and No. 707 is solid jasper and as was previously mentioned, the south footwall was found to have rolled vertically to the north, thereby greatly decreasing the size of the ore body.

360' Sub-Level

The only operations at this elevation were completed early in the year and consisted of the recovery of a very small pillar of Lloyddale ore lying between the mills on the south side of the transfer drift east of Raise No. 732. A short drift was also driven to the southeast of Raise No. 734 and a small quantity of ore of both grades milled down from the west side of No. 4 stope.

7TH LEVEL

There were no operations on this level with the exception of the development work which was previously described and a large amount of exploration drilling which will be discussed later.

d. Timbering

The increase in the cost per ton for timber, lagging, poles, etc. was due to two major factors; the first of which was a substantial increase in the price of this material. The cost of cribbing timber advanced from .037 per foot in 1941 to .048, an increase of 30%. Smaller, though substantial increases, were also made in the price of the different sizes of stull timber. The amount of

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7. UNDERGROUND (Cont.)

d. Timbering (Cont.)

stull timber used during the current year was slightly smaller than for 1941 due to the fact that a larger proportion of the product was recovered from sub-level stoping operations where very little timber is used. The amount of cribbing timber, however, was almost three times as great as for the previous year due to the large raising program above the 7th Level. This increase in amount, plus the increase in price, brought the total expenditure during 1942 to almost four times that for the previous year.

The increase in the price of cribbing timber was due partly to a shortage of labor in the woods-working operations and to a greater extent to a scarcity in the supply of suitable material. During the latter months of the year, hardwood cribbing was substituted for the usual tamarack in those portions of new raises where long life and resistance to rot is not of paramount importance. It is hoped that the use of hardwood can gradually be increased to about 25% with a proportionate saving of tamarack.

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7. UNDERGROUND (Cont.)

d. Timbering (Cont.)

Statement showing timber used for 1942

	Lineal Feet	Avg. Price Per Foot	Amount 1942	Amount 1941
6" to 8" Cribbing Timber	86,794	.048	4171.88	1083.20
8" to 10" Stull "	78,648	.071	5560.47	5872.79
10" to 12" " "	46,989	.100	4722.11	5351.15
12" to 14" " "	10,314	.137	1409.10	1329.08
Total Timber 1942	222,745	.070	15522.14	
" " 1941	181,805	.075		13636.22
	Per 100 Feet			
7 Ft. Lagging	1,227,054	.90	11054.43	8771.69
3½" Poles	413,135	1.64	6792.36	6324.60
Wire Fencing	4,125	6.27	259.02	455.40
Total Poles & Fencing	417,260	1.69	7051.38	6780.00
Total Lagging, Poles and Fencing 1942	1,644,314	1.10	18105.81	
Total Lagging, Poles and Fencing 1941	1,603,065	.97		15551.69
Product - Tons			568,036	558,253
Feet of Timber per Ton of Ore			.392	.326
" " Lagging " " " "			2.160	2.008
Feet of Lagging per Foot of Timber			5.509	6.166
Cost per Ton for Timber			.0273	.0244
" " " " Lagging			.0195	.0157
" " " " Poles & Fencing			.0124	.0121
Cost per Ton for All Timber			.0592	.0523
Equivalent Stull Timber to Board Measure			364,095	317,044
Feet of Board Measure per Ton of Ore			.641	.668

	Year	Cost Per Ton	Amount
Cost of Timber, Lagging, Poles, Fencing	1942	.0592	33,627.95
	1941	.0523	29,187.91
	1940	.0605	28,851.64
	1939	.0626	19,899.00
	1938	.0579	15,801.49

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7. UNDERGROUND (Cont.)

e. Drifting and Raising

Drifting and raising operations were carried on at a very high rate throughout the entire year in order to keep pace with the heavy production schedule. Due to the small size of the remaining ore body and the spotty nature of the enrichment, larger amounts of this type of work were necessary to develop sufficient quantities of ore. The total of 19,476', exclusive of shaft sinking and drifting on the 8th Level and the new skip pit, compares with 10,873' in 1941, 10,043' in 1940, and 6,300' in 1939.

The following table includes all drifting and raising whether chargeable to E & A's, ventilation, or exploration with the exception of the work done under E & A, CC-86 which is listed separately.

	Ore Drift	Rock Drift	Total Drift	Ore Raise	Rock Raise	Total Raise	Grand Total
1942	10579	761	11340	7667	469	8136	19476
1941	6682	713	7395	3298	180	3478	10873
Increase			3945			4658	8603

If the small untimbered raise and drift development is eliminated from the above table, the full-size development may be shown as follows:

1942	3814	621	4435	1807	290	2097	6532
1941	2228	597	2825	481	92	573	3398
Increase			1610			1524	3134

In addition to the above footage, the shaft sinking crew accomplished the following work under E & A, CC-86:

150' of shaft sinking including all timber
34' of 6' x 8' winze (30' starting the shaft, 4' at the bottom of the shaft beneath the counter-weight pipe)
The equivalent of 37' of large rock drift cutting pockets and bearer hitches
The equivalent of 81' of large rock drift excavating skip pit and sump
The equivalent of 316' of large rock drifting and stripping on 8th Level plat

Totals:	Shaft sinking	150'
	Sinking winze	34'
	Large rock drifting	434'

f. Explosives, Drilling and Blasting

The amount of powder used per ton of ore recovered increased slightly during the past year due to the fact that the whole ore body is going through a considerable change in hardness and Silica content, both of which are becoming greater. Further, considerable quantities of Siliceous grade ore were produced in top slicing operations in the lean areas. The breaking of this material required considerably more powder.

The use of "Master Fuse Lighters" and the Hercules "Primatubes" was continued throughout the year with complete satisfaction. The primatubes do not show up in the following table due to the fact that they were all used in the shaft sinking operation.

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7. UNDERGROUND (Cont.)

f. Explosives, Drilling and Blasting (Cont.)

The explosives statements are shown under the following headings:

BREAKING ORE	Quantity Lbs.	Average Price	Amount 1942	Amount 1941
Gelamite Powder #1	254,127	11.50	29,224.06	27,502.99
Fuse - Feet	851,143	5.15	4,382.90	4,105.19
#6 Blasting Caps	119,727	12.20	1,460.68	1,400.64
Tamping Bags	16,000	2.06	33.03	38.50
Fuse Lighters	22,800	6.73	153.44	130.31
Fuse Cartridges	5,050	19.94	100.69	106.69
Primatubes				42.66
Total Fuse Caps, Etc.			6,130.74	5,823.99
Total Exp. Breaking Ore			35,354.80	33,326.98
Product, Tons			568,036	558,253
Lbs. Powder per Ton of Ore			.447	.428
Cost per Ton for Powder			.051	.049
Cost per Ton for Fuse, Caps, Etc.			.011	.010
Cost per Ton for All Explosives			.062	.060
DEVELOPMENT IN ROCK#				
Gelamite Powder #1	4,355	11.50	500.83	597.88
Fuse, Feet	16,050	5.15	82.66	103.93
#6 Blasting Caps	2,300	12.20	28.06	34.87
Tamping Bags				1.00
Fuse Lighters	450	6.73	3.03	14.18
Fuse Cartridges				2.48
Total Fuse, Caps, Etc.			113.75	156.46
Total all Explosives			614.58	754.34
Raising &) Rock Drifting,) Feet#			701'	769'
Cost Per Foot for Powder			.714	.777
Cost Per Foot for Fuse, Caps, Etc.			.162	.203
Cost per Foot all Explosives			.876	.981
Grand Total Explosives Used in Mine#			35,969.38	34,081.32
Cost per Ton All Explosives Used			.063	.061
Average Price per Lb. for Powder			.115	.115

Exclusive of work chargeable to exploration, ventilation, and E & A's

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7. UNDERGROUND (Cont.)

g. Ventilation

With several minor exceptions, where it was necessary to use auxiliary fans, the main ventilation system continued to operate satisfactorily. The main fan on the 4th Level at the Section 6 shaft was operated 24 hours a day without failure or breakdown. All main air-ways were kept in a good state of repair and new ones driven as needed. Due to the fact that the main working areas are now much lower than when the fan was originally installed, the loss by friction in the main air-ways has been steadily increasing with a subsequent loss of volume. In an attempt to counter-act this loss, a new, larger motor pulley was installed early in the year. This larger pulley changed the ratio of fan speed to motor speed and increased the delivery considerably. Throughout the year this delivery was well in excess of the original rated 20,000 cu. ft. per minute.

A considerable amount of work was done throughout the year maintaining air doors and air seals where leakages to the shaft are not desirable. All of the levels down to and including the 6th are kept well blocked in order to force all of the air through the working places.

In anticipation of the day when the present low pressure fan will not suffice, a thorough ventilation study was made. It was finally decided that a larger high-pressure fan, capable of a much greater delivery, would be purchased and installed at the Spies Virgil Mine, the expected life of which is very short. In all probability operations at the Spies Virgil will be brought to a close late in 1943 after which this new fan will be moved to the Lloyd and installed on surface at the Section 6 shaft.

A number of raises and drifts were driven during the year exclusively for ventilation purposes: in December a new raise in rock was started in the 530 Cross-cut on the 5th Level just south of the main drift. This raise will be put up approximately 60' to take the place of the lower portion of Raise No. 530 which is becoming very difficult to keep in the proper state of repair. Two main air raises were maintained throughout the year between the 6th and 5th Levels along the north edge of the main slicing area. As mining progressed from sub to sub, connections were made with these raises in the footwall rock just north of the ore body. By the end of the year one of these raises had caved beyond repair and another was being put up to take its place. Throughout the year, the timber raise between the 515' Sub-Level and the 5th Level served very satisfactorily as a ventilation raise for the slicing area. At the end of the year preparations were being made to hole to this raise from the 7th Level below and to put up an entirely new ventilation raise in rock between the 6th and 5th Levels from the main drift several hundred feet west of the 680 Cross-cut. The new mining raises between the 7th and 6th Levels served very satisfactorily for ventilation purposes, as did Raises Nos. 700, 701, and 742. These latter raises serve the sub-level stoping area.

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8. COST OF OPERATING

a. Comparative Mining Costs

	1942	1941	Incr.	Decr.
Product, Tons	568,036	558,253	9,783	
Underground Costs	1.324	1.204	.120	
Surface Costs	.167	.166	.001	
General Mine Expense	.234	.251		.017
Cost of Production	1.725	1.621	.104	
Depreciation	.042	.044		.002
Taxes	.069	.082		.013
Loading and Shipping	.058	.041	.017	
Total Cost at Mine	1.894	1.788	.106	
Budget Estimated at Mine	1.988	1.659	.329	
Number of Operating Days	309	305	4	
Number of Shifts & Hours	3, 1-8 Hr.	28, 1-8 Hr.		
	51, 2-8 Hr.	24, 2-8 Hr.		
	255, 3-8 Hr.	253, 3-8 Hr.		
Average Daily Product	1959	2006		47

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8. COST OF OPERATING (Cont.)

b. Detailed Cost Comparison

	1942		1941	
	Amount	Per Ton	Amount	Per Ton
1. Exploring in Mine	25282.31	.045	15151.92	.027
3. Development in Rock	7533.12	.013	9028.64	.016
4. Development in Ore	105973.33	.186	54881.18	.098
5. Stoping	246273.89	.434	267998.51	.480
6. Timbering	185054.77	.326	165357.72	.296
7. Tramming	81843.06	.144	71643.90	.128
8. Ventilation	3376.20	.006	2201.49	.004
9. Pumping	11110.11	.020	8563.22	.015
10. Compressors and Air Pipes	26809.01	.047	26106.30	.047
11. Back Filling	119.55		457.00	.001
12. Underground Superintendence	20435.26	.036	20614.67	.037
14. Maint. Comp. & Air	1280.26	.002	997.88	.002
15. Scrapers & Mech. Loaders	17764.36	.031	13033.25	.023
16. Electric Tram Equipment	18028.72	.032	14896.00	.027
17. Pumping Machinery	1233.34	.002	1366.69	.003
Total Underground Costs	752117.29	1.324	672298.37	1.204
18. Hoisting	31620.99	.056	29546.21	.053
19. Stocking Ore	16986.65	.030	20506.88	.037
20. Crushing at Mine	1455.74	.003	2259.49	.004
21. Dry House	9630.96	.017	9617.54	.017
22. General Surface Expense	14973.49	.026	9072.22	.016
23. Maint. Hoisting Equipment	7349.70	.013	5609.80	.010
24. Shaft	4458.52	.008	2161.74	.004
25. Top Tram Equipment	3348.84	.006	4885.45	.009
26. Docks, Trestles & Pockets	3559.22	.006	3036.80	.005
27. Mine Buildings	1328.86	.002	5905.28	.011
Total Surface Costs	94713.07	.167	92601.41	.166
Vacation Expense	13718.67	.024	12397.06	.022
28. Insurance	4074.00	.007	4104.22	.007
29. Mining Engineering	3225.63	.006	2920.02	.005
30. Mech. & Elect. Engineering	1639.57	.003	1969.31	.004
31. Analysis & Grading	19403.35	.034	13555.95	.024
32. Personal Injury	14327.56	.025	28350.11	.051
33. Safety Department	1580.65	.003	1493.64	.003
34. Telephones & Safety Devices	2533.31	.005	1565.09	.003
35. Local & Gen. Welfare	7320.77	.013	8703.50	.016
36. Spec. Exp. Pensions & Allow.	11864.31	.021	7636.18	.014
37. Ishpeming Office	16447.65	.029	15687.23	.028
38. Social Security Taxes	17286.08	.030	25798.82	.046
39. Mine Office	19511.52	.034	15599.55	.028
Total Gen'l Mine Expenses	132933.07	.234	139780.68	.251
Cost of Production	979763.43	1.725	904680.46	1.621
40. Taxes	39236.21	.069	45404.13	.082
Total Cost	1018999.64	1.794	950084.59	1.703
Budget Estimated Cost		1.894		1.578

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8. COST OF OPERATING (Cont.)

b. Detailed Cost Comparison (Cont.)

	1942		1941	
	Amount	Per Ton	Amount	Per Ton
41. General Supplies	31678.81	.056	32328.41	.058
42. Iron and Steel	10150.27	.018	8797.74	.016
43. Oil and Grease	2311.64	.004	1979.93	.003
44. Machinery Supplies	20319.61	.036	20418.60	.037
45. Explosives	36038.76	.063	34167.66	.061
46. Lumber and Timber	41906.63	.074	37996.51	.068
47. Fuel	2221.20	.004	1681.52	.003
48. Electric Power	51211.44	.090	49529.21	.089
49. Sundries	15935.40	.027	2909.26	.005
50. Other Mines and Accounts	314.58		340.57	.001
Total Supplies	211459.18	.372	189468.27	.339

In the following discussion of comparative costs, no explanation is made unless the difference is large enough to be significant.

1. Exploring in Mine
This large increase is due to the increased diamond drilling program which was carried on in an attempt to discover additional reserves.

4. Development in Ore
This item is practically double that for the previous year and again reflects the great attempt which is being made to explore and develop every possible source of additional ore.

5. Stoping
This decrease was due, in part, to the increase in production; and, to a greater extent to the fact that several very satisfactory open stopes were in production during the year. In addition, a greater proportion of the production was obtained from development operations. The details of the stoping account, excluding the ore obtained from development work is as follows:

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8. COST OF OPERATING (Cont.)

b. Detailed Cost Comparison (Cont.)

5. Stoping (Cont.)

	1942		1941	
	Amount	Per Ton	Amount	Per Ton
General Supplies	9,783.58	.021	10,783.50	.021
Iron and Steel	3,790.38	.008	2,515.96	.005
Oil and Grease	348.23	.001	426.42	.001
Machinery Supplies	5,011.92	.011	4,245.32	.008
Explosives	23,016.37	.049	26,298.58	.058
Lumber and Timber	6.16	.000	5.24	.000
Electric Power	4,224.69	.009	3,969.06	.007
Sundries	3,608.15	.008	279.54	.001
Expense Accounts	668.23	.001	416.12	.001
Total Supplies	50,457.71	.108	48,939.74	.102
Payroll Labor	187,282.40	.400	213,235.41	.412
Cliffs Shaft Labor	87.84	.000	56.88	.000
General Shops Labor	1,538.85	.003	1,053.68	.002
Shops, Labor, Etc.	6,907.09	.015	4,712.80	.009
Total Labor	195,816.18	.418	219,058.77	.423
GRAND TOTAL	246,273.89	.526	267,998.51	.525
Production Tons Stoped	468,543		517,660	
Avg. Miners Rate for Stoping	8.48		7.99	
Avg. Tons per Man Stoping	23.80		21.62	

6. Timbering
This increase was due to the fact that the increased rate of operations caused more weight on main level drifts and sub-level connecting drifts with the result that more repairs were necessary.

9. Pumping
The increase in this item was due entirely to the increase in the amount of underground water during the past year. The amount pumped by the Inland Steel Company for the past several years is shown in the following table:

		Inland Steel Co.			C.C.I. Co.		
		Amount	Per Cent	Avg. Gal. Per Min.	Amount	Per Cent	Avg. Gal. Per Min.
Total	1942	$ 42,644.22	86.0	847.1	$ 7,013.13	14.0	101.0
	1941	60,245.97	93.22	898.4	4,225.55	6.78	66.0
	1940	70,978.13	90.13	1,155.4	7,769.69	9.87	125.1
	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

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8. COST OF OPERATING (Cont.)

b. Detailed Cost Comparison (Cont.)

9. Pumping (Cont.)

For the second consecutive year, the total amount of underground water pumped at the Morris Mine shows a decrease. This is due to a continuation of pumping from surface wells by the Inland Steel Company; and was effected in spite of an increase in the amount of Lloyd water pumped at the Morris, which was 101.0 G.P.M. as compared with 66.0 the previous year. This increase is due to the fact that operations at the Lloyd are at lower elevations, with the result that a greater proportion of the water is concentrated on the 6th and 7th Levels. The water at the Lloyd totaled 177.5 G.P.M. divided as follows: 101.0 from the 6th and 7th Levels pumped at the Morris, 59.4 G.P.M. from the 3rd, 4th, and 5th Levels pumped at the Lloyd, and 17.1 G.P.M. from the 2nd Level used for the Mine and Location water supply. This compares with the following 1941 figures: total 147.7, 6th and 7th to the Morris 66.0, 3rd, 4th, and 5th Levels 59.7 and 22.0 from the 2nd Level. Once again the 2nd Level supply was inadequate and additional water was obtained from No. 8 Surface Well West of the Morris Shaft.

16. Electric Tram Equipment

This increase is due almost entirely to the purchase of one additional underground locomotive and extensive repairs and overhauling.

22. General Surface Expense

This increase is due to the large program of Plant Protection which included flood lights, new roads, fences, etc.

23. Maintenance: Hoisting Equipment

This increase is due to extensive replacement of shaft runners and the new hoisting ropes which were installed for the 8th Level.

24. Maintenance: Shaft

This increase was occasioned by extensive repairs necessary in the shaft and more frequent shaft inspections.

26. Maintenance: Docks, Trestles and Pockets

This increase is due to the rebuilding of the permanent wood trestle east of the shaft.

40. Taxes

This decrease is due to the increase in production and the decrease in valuation caused by diminishing reserves.

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9. EXPLORATIONS AND
FUTURE EXPLORATIONS

The diamond drilling program was continued at a fast rate throughout the entire year with very discouraging results. The old air-driven drill was replaced by a new electric machine and a new small air drill was purchased late in the year. The bulk of the drilling was done with the larger machines and totaled 5,187 feet at a cost of $ 4.664 per foot - total $24,193.32. This cost per foot was very high due, in part, to breaking the rods in hole #137 early in December. The remainder of the year was spent fishing for the rods and bit. The "Gopher" drill was started early in November, and by the end of the year had drilled 213 feet at a cost of $347.80 or $ 1.633 per foot. The total expenditure for drilling was $25,282.31 which included $741.19 spent in excavating drill cut-outs and stations. This charge was taken up in operating costs without an E & A at a rate of $ .045 per ton as compared with $15,151.92 and $ .027 per ton in 1941.

For the most part, the drilling was done in an attempt to discover additional reserves outside the limits of the known Lloyd East ore body and was completely without success. The drilling by the "Gopher" machine was in advance of operations within the known structure.

The following table is a record of the drilling, a comprehensive discussion of which will be found in the report of the Geological Department.

With the exception of recovering the bit and completing the drilling in Hole #137, very little future exploration is planned. The large amount of drilling during the past two years has almost exhausted any possibility of discovering additional reserves outside the limits of the present Lloyd East Deposit. Drilling within the known structure will be done with the small "Gopher" drill.

LLOYD MINE EXPLORATION

YEAR 1942

NO.	LOCATION	DIRECTION	DIP	DATE STARTED	DATE FINISHED	MATERIAL	FINISHED DEPTH
125	6th Level S.3484.25 & 1692.66E	N.78° 44'W	-31°	1/3/42	1/14/42	L.O., Ore 15' to 85', Jasper	170 Ft.
126	+515' Sub. S.3582.82 & 1594.99E	S.42° 29'W	Hor.	1/22/42	1/30/42	L.O., Jasper, Slate	113 Ft.
127	+515' Sub. S.3559.65 & 1604.21E	N.68° 25'W	Hor.	2/3/42	2/9/42	Jasper	96 Ft.
128	7th Level S.3272.62 & 289.21E	S.29° 48'W	Hor.	2/11/42	3/25/42	Slate, Jasper, Lean Ore, Dike	745 Ft.
129	7th Level S.3277.15 & 294.00E	S.0° 28'W	+2°-30'	3/27/42	4/17/42	Slate, Jasper, Dike	563 Ft.
130	7th Level S.3273.49 & 298.75E	S.43° 10'E	+2°-30'	4/20/42	6/17/42	L.O., Jasper, Dike	641 Ft.
131	5th Level S.2791.86 & 1397.19E	S.24° 53'W	Hor.	5/23/42	6/10/42	Slate, Jasper, Slate	392 Ft.
132	7th Level S.3180.82 & 1003.72E	S.32° 43'E	Hor.	6/20/42	7/29/42	Slate, Jasper, L.O., Dike	646 Ft.
133	7th Level S.3192.62 & 999.61E	Due South	-23°	8/7/42	9/7/42	Slate, Jasper, L.O., Dike	565 Ft.
134	7th Level S.3180.63 & 1000.01E	S.13° 02'E	-40°	9/9/42	10/2/42	Slate, L.O., Jasper, Dike	415 Ft.
135	7th Level S.3270.48 & 291.67E	S.0° 59'E	-44°	10/20/42	11/13/42	Slate, Jasper, Dike, Ore 210' to 230'	553 Ft.
136#	+415' Sub. S.3120 & 2198E	N.5° E	Hor.	11/9/42	12/1/42	Jasper, L.O., Ore 0' to 4', Ore 42' to 60'	109 Ft.
137##	7th Level S.3263.70 & 291.69E	S.2° 2'W	-70°	12/2/42	Contd.	Slate, Jasper, L.O.	347 Ft. (12/31/42)
138#	+515' Sub. S.3043 & 2368E	N.70° W	0°	12/5/42	12/10/42	Jasper	50 Ft.
139#	+515' Sub. S.3040 & 2370E	N.40° W	+1°	12/11/42	12/19/42	Jasper	34 Ft.
140#	+515' Sub. S.3040 & 2370E	Due North	+1°	12/21/42	Contd.	Jasper, L.O.	20 Ft. (12/31/42)

#Gopher Drill Hole
Broke rods December 19th, spent remainder of year fishing for rods and bit.

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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.

	1942		1941	
Lloyd & Section 6	Valuation	Taxes	Valuation	Taxes
SW¼ of NW¼ of Sec.6, 47-27)				
N½ of SW¼ of Sec.6, 47-27)				
N½ of SE¼ of Sec. 6, 47-27)..	1,350,000	27,569.03	1,665,000	33,986.98
Personal, Ore in Stock, Supplies & Equipment	550,000	11,231.83	535,000	10,920.75
Total	1,900,000	38,800.86	2,200,000	44,907.73
Collection Fees		388.00		449.08
Total Lloyd Mine		39,188.86		45,356.81
C. C. I. Co. Lands Misc.				
S½ of NE¼ of Sec. 6, 47-27	320	6.54	320	6.54
SE¼ of NE¼ of Sec. 6, 47-27 Except R. of Way	350	7.15	350	7.14
S½ of SW¼ of Sec. 6, 47-27 Except R. of Way	700	14.30	700	14.29
SW¼ of SE¼ of Sec. 6, 47-27 Except R. of Way	350	7.15	350	7.14
SE¼ of SE¼ of Sec. 6, 47-27 Except R. of Way	575	11.74	575	11.74
Total	2,295	46.88	2,295	46.85
Collection Fees		.47		.47
Total CCICo. Misc. Lands		47.35		47.32
Total Lloyd	1,902,295	39,236.21	2,202,295	45,404.15
Lots in West Ishpeming	30	.62	30	.62
Lots in West Ishpeming 1940.				.69
North Lake Dwellings				
Houses on Sec. 6, The CCICo.	4,500	91.90	6,000	122.48
Collection Fees		.92		1.22
Total Dwellings		92.82		123.70
Total Ishpeming Twshp.	1,906,825	39,329.65	2,208,325	45,529.14
Rate		2,04215		2.04126

There was a substantial decrease in both the valuation and the taxes paid in spite of a slight increase in the tax rate. The decrease in valuation is due to the diminishing ore reserves which offset a small increase in personal valuation.

	1942	1941	1940	1939	1938
Tax paid per Ton Produced	.069	.082	.099	.143	.198
Tax paid per Ton Shipped	.067	.099	.093	.095	.479

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11. ACCIDENTS AND PERSONAL INJURY

There were six compensable accidents during 1942, only one of which was particularly serious. This compares with seven during 1941, one of which was a fatality. Peak operations accounted for an increase of 5,753 man days over the previous year from 88,969 to 94,722. The frequency rate on compensable accidents for 1942 was 0.063 per 1,000 man days worked as compared with 0.079 during 1941. The number of days lost time was 780 with a severity rate of 8.24 as compared with 25.13 per 1,000 man days in 1941. The above figures compare with the following averages for all of the Company's underground properties. Frequency; 0.075, severity; 7.61. The compensable accidents are listed in detail as follows:

Accident No. 814, February 12, 1942, William H. Williams - Miner: Struck by a fall of ground while trimming. Compound fracture of thumb, index finger and fifth finger; bruised body, legs and hands. Time lost - 54 days.

Accident No. 815, February 18, 1942, Joseph Zoppetti - Miner: Struck by scraper. Fracture right tibia and fibula. Time lost - 148 days.

Accident No. 816, Five days lost time, not compensable.

Accident No. 817, April 16, 1942, Arnold Emanuelson - Miner: Struck by a chunk of ore rolling down a pile. Fracture left tibia and fibula. Time lost - 116 days.

Accident No. 818, May 5, 1942, Gordon Vercoe, Miner: Struck on chest by piece of ore while working in a raise. Contusion of chest, right leg and hand. Time lost - 84 days.

Accident No. 819, May 11, 1942, Jacob Korpi, Miner: Struck by slab of ore. Fractured pelvis and punctured bladder. Time lost - 304 days, (estimated)

Accident No. 820, October 15, 1942, James Labeau, Miner: Struck on right foot by small piece of falling ore. Fractured metatarsel. Time lost - 74 days.

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION

New construction during 1942 was not very extensive although a number of small structures were erected:

The old head frame at the Section 6 shaft was torn down and replaced with a frame and corrugated iron structure which is nearly fire-proof as possible. The door entering the shaft is kept locked and the opening over the shaft is well screened. A ten foot burglar-proof fence with a locked gate was erected around this structure. At a point some distance from the shaft, a small hose shanty was built. This building houses a length of fire hose which is attached to a 2 inch line from the water tank.

The permanent trestle on the east side of the shaft, which was rebuilt in 1942, was discussed earlier in this report.

Small additions were built on the east side of the shop and the south side of the steel storage shed to provide badly needed additional space.

A small booth for the use of the watchmen was built at the main entrance to the property.

Little, if any, new construction is anticipated for 1943.

13. EQUIPMENT AND PROPOSED EQUIPMENT

The following is a list of more important items of new equipment which were added to the inventory during 1942:

1 - Set Ajax Boiler Flu Blowers	$ 150.00
2 - DA-35 Drifters @$577.73	1,155.47
2-PD-12 Drifters @ $575.00	1,150.00
4 - HC20D Auger Drills @ $190.00	760.00
2 - RB-12 Auger Drills 1-$200.30 - 1-$200.38	400.77
2 - TM6 Coppus Blowers @ $269.11	538.22
2 - Motors for Blowers @ $176.10	352.20
2 - #15T Dugas Fire Extinguishers	113.70
1 - Sullivan AF-211 D.D. Hoist	1,168.00
1 - 15 H.P. Motor for Hoist	315.00
1 - Jeffrey U. G. Locomotive	2,767.13
1 - Cleveland MDR-3 Triple Column Mine Rig	1,533.48
1 - Chlorinator	1,218.26

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13. EQUIPMENT & PROPOSED EQUIPMENT (Cont.)

With the exception of the possible necessity for purchasing a new main ventilating fan, new equipment will be limited to routine replacements.

14. MAINTENANCE AND REPAIRS

Underground maintenance and repair expense is becoming increasingly larger each year due to greater weight at lower depths and to the necessity for maintaining larger numbers of ventilation and traveling drifts and raises. This expense will undoubtedly tend to increase throughout the remaining life of the company.

b. Location

Location maintenance was lower than for the past several years as shown in the following table:

	Labor	Supplies	Total
2. Cleaning	1757.40	17.33	1774.73
3. Sewers & Cess Pools	0	0	0
4. Water	0	2489.99	2489.99
6. Fire Hydrants	0	0	0
7. Repair Fences	0	0	0
8. Water Mains	56.12	102.03	158.15
9. Water Tank	0	0	0
12. Location Xmas Tree	0	16.26	16.26
13. Fire Protection	0	0	0
Total	1813.52	2625.61	4439.13

Year - 1941	6261.66
1940	4720.39
1939	5044.89
1938	5272.04
1937	6109.82

2. Rented Buildings

The expenditure for maintenance on rented buildings was once again greatly decreased due to continued sales of company owned dwellings. Company ownership remained in only four residences in addition to the Assistant Manager's residence as compared with six at the end of 1941, twelve at the end of 1940, and one hundred and seventeen at the end of 1939. The total expenditure on rented buildings for the past several years is as follows:

1942	$ 360.90
1941	1,145.53
1940	4,323.23
1939	8,498.58

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14. MAINTENANCE AND REPAIRS (Cont.)

2. Rented Buildings (Cont.)

Practically all of the expense during 1942 was incurred in the maintenance of the Assistant Manager's residence in the location. In addition the company still owns the store building which is rented to J. B. Casper at $50.00 per month.

The North Lake clubhouse, the expense of which is carried as local welfare, required very little maintenance during 1942 as a result of extensive repairs in the previous year. The expense for building maintenance during 1942 was $320.00 as compared with $2,250.00 for the previous year. The total operating deficit was $4,027.64 as compared with $5,317.00 in 1941. Of this deficit, $960.00 was carried by the Inland Steel Company and $3,067.64 was carried by the Lloyd. The building was kept in excellent condition throughout the year and was extensively used by the location residents.

15. POWER

There were no production delays during 1942 due to lack of electric power. The total consumption during 1942 was only slightly greater than during 1941 but was almost 50 percent greater than 1940. The cost per K.W.H. was practically the same as the previous year.

	Total K.W.H.	Cost	Rate
1942	3,751,200	52,200.96	.0139
1941	3,631,200	50,289.84	.0138
1940	2,516,400	36,282.72	.01442

16. WATER SUPPLY

Once again it was necessary to augment the 2nd Level water supply for the mine and location by pumping from #8 Well, west of the Morris shaft. A new chlorinating machine was installed at this pump and no trouble was experienced with improperly treated water.

A nominal amount of repairs and maintenance work was necessary on the concrete storage tank.

17. CONDITION OF PREMISES

The new road into the property and the new parking area greatly increased the appearance of the property and made it much easier to supervise parking. The lawn and flower garden were maintained in their usual attractive condition although little new planting was done.

With the exception of re-seeding the lawn, replanting the hedge and rebuilding the fence around the Clubhouse grounds, no maintenance work was done at the location. The cleaning and maintenance of the streets and storm sewers are now being ably handled by the County Road Commission.

The plans for the installation of a combination sanitary and storm sewer system at the location will probably have to be held up for the duration of the war due to discontinuing of the W.P.A. and a shortage of man power and materials.

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18. NATIONALITY OF EMPLOYEES

	American Born	Foreign Born	Total	Per Cent
Finnish	97	40	137	42
American	38		38	11
Italian	22	30	52	16
French	39	2	41	13
English	25	4	29	9
Swedish	18	4	22	7
Norwegian	4		4	1
Austrian	3	1	4	1
Yugo-Slavian		1	1	
Belgian	1		1	
Czekoslavakian	1		1	
German	1		1	
Irish	1		1	
	250	82	332	100

The ratio of American born to foreign born remained practically the same as reported for the last year. The percentage of employees of Finnish descent increased from 35 to 42 while the percentage of Americans decreased from 22 to 11. This was due to the large number of American boys entering the services. The employees of French descent increased from 8 to 15 with minor changes in other nationalities.

MATHER MINE

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1. GENERAL:

The end of the second year in the opening program of the Mather Mine virtually marked the change from surface plant construction and shaft sinking to underground development. Drifting is expected to be underway on the 1600' and 1750' levels about the middle of January 1943, with limited ore production from development headings following later in the year.

Surface construction included completion of the headframe, rock trestle and a portion of the ore trestle. The fine new buildings were occupied, and permanent machinery and electrical equipment installed and in most cases already operating. Landscaping was done, railways graded and partly laid, timber tunnels and yards formed and other surface work generally advanced to the final stages.

Shaft sinking reached a depth within 32' of the initial objective of 2352'. Gouge filled jointing systems in the footwall rock series required extra concrete and delayed finishing the shaft beyond the year end. This disappointment, however, was offset by the fact that the surface and underground crews worked through the year without a lost time accident. Small openings were cut for levels at 150' intervals from the 1450' to 2200' depths except at the 2050' where wall conditions made this inadvisable.

Diamond drill exploration continued with favorable results in the north half of the section, and the shaft itself with 39' of high grade ore from the 1889' to 1928' depths extended ore reserves well beyond previously known outlines.

3. ANALYSIS:

Samples picked at intervals as the shaft was sunk through the iron formation varied from 40.40% Fe at a depth of 1452' to 28.80 Fe at 1872'. When the shaft entered ore at a depth of 1889', channel samples were taken along the north wall to the lower contact at the 1928' depth. The exceptionally high iron content of this 39' of ore is notable in the following average:

Fe	Phos.	Sil.	Sul.
64.07	.125	3.54	.017

The ore ranged in appearance and physical characteristics from a soft, sticky red hematite to a semi-hard blue ore, the latter appearing in the upper half of the formation. A moisture sample taken 15' north of the shaft on the 1900' level opening ran 9.20%, indicating a natural iron content of about 58% in the above average. Incomplete samples of the 1330 tons of ore stocked east of the engine house,

show some dilution with wall rock in the following return:

Fe	Phos.	Sil.	Sul.
62.90	.144	3.90	.016

ESTIMATE AND ANALYSIS OF ORE RESERVES:

There has been no estimate of the Mather Mine ore reserve since the geological department in 1939 calculated 7,000,000 tons of ore developed by drilling in the S½ of the NE¼ of Section 2. Ore limits since that time have been extended into the SE¼ by holes 44 and 45, to the N½ of the NE¼ by holes 49 and 50, and to the NW¼ by the shaft. There is, however, no information yet at hand to prove or disprove, using one example, the fact that ore may extend from hole 39 a distance of 3200' west to the shaft. Holes 16 and 50 seem to bear this out, but they cover little more than 1/3 of the distance from number 39.

The success to date in locating ore over this widespread area proves a tonnage so large that it will be some years in the future before structural details can be filled in to form the basis of an estimate. In the meantime, it may be said that the drilled and potential reserve being developed at the Mather, is the greatest for any shaft yet opened on the Marquette Range.

5. LABOR AND WAGES:

a. Comments:

The mine labor force remained fairly stationary at an average of about 85 men, but with a higher than normal turnover because of enlistments and the draft. Fourteen deferments were granted, which is probably an unusually large proportion of the total force, because of the number of skilled workers now employed in opening the mine. Replacement of miners would have been virtually impossible without this ruling, although there still remained a plentiful supply of common labor.

The one year signed contract with the independent Marquette Range Industrial Union continued in effect to Dec. 12th. The few grievances and complaints were amicably adjusted by regular procedure, but beyond this there was little to hold the men's interest. Starting in the fall a concerted drive was underway by the CIO, and with the strong pressure brought to bear it appears only a question of time before this union obtains a majority membership with subsequent call for an election.

The last change in wages was the 10 cent an hour increase effective April 1, 1941 which provided a minimum of 72½¢ per hour. The rate and one-half payment for more than 8 hours per day or 40 hours per week continued in effect, with the added provisions for holidays and double time for the seventh day in the President's executive order No. 9240. The daily company account shaft miner's rate was $8.00, and the shaft crews with a contract price of $70 per foot of sinking varied from $9.04 to $12.64 per day exclusive of overtime.

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b. Statement of Wages:

		1942	1941
Number of Shifts & Hours:		8 1 8-hr.	17 1 8-hr.
		53 2 8-hr.	47 2 8-hr.
		252 3 8-hr.	239 3 8-hr.
Average No. of Men Working:			
	Surface	44-3/4	31
	Underground	39-1/2	34
	Total	84-1/4	65
Average Wages per Day:			
	Surface	6.71	6.51
	Underground	11.37	10.33
	Total	8.72	8.48
Wages per Mo. of 25 Days:			
	Surface	167.75	162.75
	Underground	284.25	258.25
	Total	218.00	212.00
Labor Cost per Ft. of Sinking:			
	Sand and Rock		144.91
	Rock	153.92	
Total No. of Days:			
	Surface	15,336	10,570-1/4
	Underground	11,594-1/4	9,528-1/2
	Total	26,930-1/4	20,098-3/4
Amount for Labor:			
	Surface	102,957.42	68,860.38
	Underground	131,896.23	98,507.75
	Total	234,853.65	167,368.13

6. SURFACE:

a. Buildings:

The Austin Co. completed building construction late in 1941. The mine crew then concentrated on installing machinery in the engine house, with the Nordberg cage hoist going into service February 15th, followed by the first Ingersoll-Rand compressor 2 days later. The work of cleaning and painting these installations then coincided with erection of the second compressor, the skip hoist, skip motor-generator flywheel set and necessary extensive wiring and piping systems.

During April clothes racks, benches and locker bases were built in the dry wing to accomodate about 100 men. The welded steel design was standardized so that additions for the expanding crews will match in the future. Permanent work benches were built in the shops, bins and a semi-private enclosure in the warehouse for

the supply clerk. The buildings were occupied early in May and equipment transferred shortly thereafter. It is believed everyone shared the feeling of moving into quarters that could not be surpassed, and many of the men made a point of expressing their pleasure and appreciation.

The temporary buildings north and west of the shaft, excepting the engine house, were sold for $567 to effect their removal from the property without additional labor expense. Their new owners dismantled and removed the oil house, shop building, office and dryhouse well ahead of the time construction started on the timber tunnels.

b. Landscaping and Roads:

Grading of the approach, or west side of the buildings was hurried to completion in May so that fertilizing and planting could follow immediately. Well spaced rains then fortunately added growth of flowers, shrubbery and the lawn so that in July and the following months a most attractive foreground appeared for the buildings. Filling of the parking area with shaft rock meanwhile went forward, and in the fall the rising slope toward the south side of the engine house was planted with shrubbery. The inner court between the shop and dry wings was graded, but planting and gravel treatment under the ropes was postponed until all of the permanent idler stands are in place.

The road curving north to the mine from the east end of Wabash St. was paved from the section line to within a short distance of the future parking area. The work was done by the City of Ishpeming and paid for by the Negaunee Mine Co. under the same arrangement covering the grading and plowing of roads in Section 2. By the end of the year the shaft rock fill southwest of the engine house had virtually covered the old road in the depression, and entrance to the mine was on this nearly level fill which to the east, as mentioned above, will form the parking area. The road into the garages under the west end of the engine house was bordered, to lend interest to this section, by planting a rock garden and shrubbery on both slopes. The driveway and small parking area in front of the office was rock filled and given a thin coating of gravel in preparation for paving in the future.

The road connecting with highway U.S. 41 to the north will be blocked by tracks and the west timber tunnel. A somewhat longer, but more level replacement is planned farther west to avoid crossing these tracks, but is pending execution of easements from the O. I. M. Co. and Palms-Book Land Co. This road reduces the distance about 1 mile when driving to or from Negaunee, and will become more important as the mine crews are increased in the future.

c. Headframe and Trestle:

Construction of the headframe and rock trestle, and later the ore trestle lead, was underway by the Worden-Allen Co. practically

throughout the year. A shortage of steelworkers handicapped this work, but progress was steady nevertheless.

The structural steel for the headframe was erected, and 3 of the 4 head sheaves in place by the end of March. A 12' sheave had been mounted temporarily at the landing floor elevation to provide for the change from the temporary to permanent cage hoist. This was done February 15th without interrupting the shaft sinking, as was also the case when the final change to the head sheave was made on May 24th. The old wood headframe was removed and steel bracing around the cage road inserted, again without delaying the shaft, by paying the Worden-Allen overtime for several Sundays. Close cooperation by the steel and mine surface crews enabled this work to be done safely, and by June 9th the shaft was enclosed and riveting and painting of the remainder of the structural work nearing completion.

Employing only one crew, the placing of the corrugated covering on the headframe started in June and was finished in October. Installation of the elevator started in July, followed by electrical wiring for lighting and the crusher motor, air lines and cylinders, and all of the mechanical devices necessary to complete the flow sheet from skip dump to larry car or railroad bins. A fireproof control room was built above the landing floor in which one man can operate the valves for the removable grizzly, the butterfly gate, and the loading chutes for the larry cars. A second enclosure was made in the southwest corner of the headframe on the landing floor for the storage and repair of the larry cars, and by the end of the year all were ready to go into use with the 12 ton skips when loading pockets are constructed underground.

Erection of the rock trestle leading northeast of the shaft began in March and was completed in July. The mine crew then laid the creosote treated fir decking in the headframe, along the rock trestle and the initial section of the ore trestle east of the shaft. A contract was awarded Worden-Allen Co. in March for the remainder of the ore trestle curving south and east, and erection of this double lead started in December, the surface crew having poured the concrete piers 2 months previously. Erection of this first ore trestle is expected to reach completion by about February 1943, well ahead of the time needed by the mine force to lay the decking and prepare for stocking ore.

d. Tracks:

The L. S. & I. Rd. survey crew staked the final location of the shaft and timber tracks in June, and grading by Lindberg & Sons, contractors, was underway the following month. A mutually advantageous arrangement had been made with the railroad company whereby the east mine timber yard was excavated and shaped to supply the extra fill for the up-grade tail tracks west of the shaft. A little more than 100,000 cu. yds. was moved on the project with

grading completed late in September.

The railroad section crews then laid the 2 pocket tracks and the passing and timber tracks, leaving gaps under the headframe for storage of supplies for shaft sinking and trestle construction. These will be closed when the original spur to the shaft from the center stockpile track has served its purpose and is taken up. It is interesting to note that to the end of 1942 approximately 235 carloads of supplies and equipment have been unloaded from this track for the opening of the mine, not including the more than 40 cars switched into the engine house for unloading with the overhead crane.

e. Timber Tunnels:

Construction of the timber tunnels north of the shaft was resumed in July, the original openings having been formed when the concrete shaft collar was poured last year. Steel piling was driven to a depth of 20' and braced to protect the massive headframe pier footings, and the excavating done by a rented 1 yd. dragline shovel.

The lower tunnel was then built a distance of 60' northeast to the diorite ledge where it is planned to connect in the future with a rock drift from the east timber yard. This tunnel will parallel the timber (north) railroad track, passing under the rock trestle to make the connection from this lower timber yard to the concreted section now in place.

The initial 350' length of the upper, or west, tunnel would have been finished in the space of a few weeks except for the occurence of a ridge of diorite ledge which had to be blasted out of the way. The east end of this ridge was less than 100' distant from the shaft, headframe, and west wing of the buildings. Blasting was limited to the times when the men were not in the shaft, and then to one hole at a time under heavy covering, so the time and expense were considerably more than anticipated. A stairway and control room 12' x 12' between the pocket and passing tracks was built with the upper tunnel, and the tunnel roof also included heavy steel reinforcing beams under 3 tracks. The timber yard was graded as far west as the road, and is ready for delivering timber to the mine although concreting of the rock section of the tunnel was deferred until spring. Both tunnels have sidings near the shaft for empty timber trucks and are slightly downgrade from the shaft to provide drainage. The excavation for the tunnels so far amounted to 2840 yds. of gravel and 580 yds. of rock, with an estimated 26,000 yds. of gravel from the timber yards, practically all of which was needed by the railroad company for excess fill.

f. Pipe Line:

A 10" welded discharge line was laid along the floor of the building tunnel from the shaft to the engine house, and into the

main catch basin on the west side of this building into which also empty the storm and sanitary mains. Leading from the west side of this concrete basin, an 18" diameter spiralweld pipe was laid a distance of nearly 4000' to the culvert under Second Street on the north side of Ishpeming. The purpose of this long pipe line was to avoid discoloring and contaminating Lake Bacon and its outlet creek along the small settlement of houses on U.S. Highway 41.

Permission was obtained from the State Highway Department and 120' of pipe was installed in the culvert under U.S. 41 in February before the spring break up. Then in April and May, using rented equipment, the remainder of the pipe was laid on an average grade of 0.47%, 1300' of the length on steel piling across the swamp north of the lake. The outside of the pipe was repainted with asphalt where the 40' lengths had been scratched getting them into place, and all sections along side hill cuts were covered with about 2' of earth for protection against freezing. This difficulty had not occurred to the end of the year, although there is as yet comparatively little water flowing through the pipe and the weather was cold during the first half of December.

7. UNDERGROUND:

a. Shaft Sinking:

The initial shaft sinking program was within a few feet of completion, reaching a depth of 2320' on December 31st. The expectation of finishing the sinking in 1942 was upset in December by wall conditions requiring an excessive amount of concrete reinforcing, and this disappointment was shared by the whole mine force. The sinking in 1942 from the 1035' to 2320' depths was at an average rate of 107' per month, compared with 103' last year in rock, and the following table lists the progress:

Month	No.Days Worked	Footage	No.Cuts Blasted	No.Steel Sets Installed	No.Sets Concreted	Cu.Yds. Concrete	Cu. Yds. Hoisted	Advance per 24-hr. Day
January	26	122	22	18	15	57-3/4	2920	5.0
February	24	84	16	12(b)	7	42-1/2	2032	3.7
March	26	115	20	17(b)	9	43	2817	4.7
April	26	124(L)	22	18	11	47-3/4	2976	5.1
May	27	112	24	17(b)	15	65-1/2	2774	4.5
June	29	118(L)	23	16(b)	16	79	2914	4.8
July	27	122(L)	24	17(b)	16	71-1/2	3024	5.0
August	26	92(L)	21	14	14	135-3/4	2540	3.8
September	26	94	21	14(b)	14	152	2648	3.8
October	27	114	23	15(b)	15	94-3/4	3042	4.5
November	24	103(L)	19	14	14	70-1/2	2754	4.5
December	25	85	16	12(b)	12	96	2468	3.8
Total	313	1285	251	184	158	956	32904	4.5

(L) in the above table indicates levels opened at 150' intervals from the 1450' to 2200' depths, excepting the 2050'; and (b) indicates concreting in place the 12" bearer sets.

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This record brings out some interesting facts regarding the dependency of progress on wall conditions. For example the advance of 124' in April required the hoisting of 2926 yds. of rock and the placing of 47-3/4 yds. of concrete to block the steel. Then in October, in the mixed slate where overbreak was hard to control, an advance of 114' produced 3042 yds. of rock and each steel set was concreted, using 94-3/4 yds. February was the only exception, the lengthier drilling time in the hard blue jasper formation controlling the sinking rate during that period.

Although the shaft was not completed at the 2352' depth in 1942 as had been hoped, progress may be held satisfactory in view of the character of rock formations encountered. The chief obstacle in the way of steady advance was the pronounced and complicated jointing system prevalent in the rock through the whole series of diorite, jasper, slate and quartzite formations. Blocky walls in the jasper gave way to an unstable and treacherous condition in the hard slates because the gouge filling the slips and fractures was composed of a grease-like black or red slate. Even though drill holes were carried well inside the steel outline, trimming resulted in overbreak, and this in turn led to extra concrete. The finished result, however, was the strong support furnished by concrete set in innumerable hitches along the rough walls.

The detailed review of sinking operations follows:

1. Geological Record:

The shaft to a depth of 2320' had passed through the typical geologic cross section of the Marquette Range. Sinking last year was to a depth of 457' in the diorite sheet, and then in jasper cut by several intrusive dikes. From the 1150' to 1300' depths during February and the first half of March 1942, the hard blue phase of the jasper was penetrated; and then it was not until August that the first slate seams were disclosed in the jasper formation at a depth of 1820'. The record below this depth, measured along the north wall, was as follows:

Black slate - - - - -	- 1841' to 1854'
Transition jasper & slate seams	- 1854' to 1863'
Soft ferruginous slate - -	- 1863' to 1889'
High grade ore - - - -	- 1889' to 1928'
Soft ferruginous slate - -	- 1928' to 1945'
Sheared black and ferrug. slates	- 1945' to 2090'
Gray and black slates - - -	- 2090' to 2156'
Hard slate and quartzite seams with decomposed slates following jointing systems - - - -	- 2156' to 2320'

The best sinking medium, as expected, would have been the gray and black slate formation had it not been for the fractured nature of the ground. Whether this condition is limited in

extent remains to be seen, but if not, a much larger proportion of underground development than anticipated will require timbering.

2. Drilling:

The depth of drill cut varied from 4 to 6½', the shorter cut being used only where required by poor wall conditions or the extreme guage loss of the bits in the hard blue jasper during February and March. Drilling was done with 11 Cleveland H111W 65-lb. sinkers, with six JB5 Ingersoll Rands for spares. The machines were inspected, cleaned and oiled between each drill period, and with this care have nearly completed the shaft over a 2 year interval with a total repair cost of $692. The total drill hole footage to date in sinking the shaft may be estimated fairly accurately using an average of 70 holes per cut and depth of 2300' to arrive at a figure of 161,000'.

The use of the standard 2¼" Ingersoll-Rand detachable jackbit was continued throughout 1942. Bit consumption was highest in February in the hard jasper, the extreme running up as high as 1700 bits needing regrinding after drilling a 4' cut. Guage loss in the jasper kept the number of bit usages down to about 6 or 7, but in the slate this increased to 10 or 12 with the bits retempered on about the 7th regrind. The quantity of bits charged to the shaft is as follows:

Detachable Bit Consumption 1941 - - -	7,636
" " " 1942 - - -	13,699
Total bits used to 2320' depth - - -	21,335

Complete sets of one inch 1/4 octagon Bethlehem hollow drill steel in the various lengths with type 0 and type 1 threads have been maintained at the shaft throughout the sinking. It seems unbelievable, but a special check was made to verify the fact that all but 94' of the original steel was still in service at the end of the year. And probably of the 94' a high proportion represented loss through stuck steel and consequent blasting. Partly responsible for this unusual length of service was the pyrometrically controlled tempering given the steel each time the bit threads were renewed. This is believed to have relieved fatigue strains, and in effect restored the steel as good as new.

3. Blasting:

A separate 110 V. power line was carried on down the shaft for safety in the use of electric delay blasting caps, the power being applied through the double switch at the shaft collar through which the shaft line always remained short circuited in the off position. The blasting remained the sole responsibility of the shift bosses, and attention thus fixed on the details that assured proper regard for the hazards involved.

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Misfires were practically eliminated last year when use of instantaneous caps was discontinued. Delays numbered from 1 to 12, and dynamite strengths in average ground were 80% and 90% to maintain the fine breakage for hand mucking. Some 60% powder was used in the softer formations as shown in the following statement of explosives used:

Kind	Quantity	Avg.Price	1942 Amount	1941 Amount
50% Gelatin Extra	4,35			5.75
60% " "	3,350	.115	500.25	575.00
80% " "	41,118	.14	5,756.52	4,030.46
90% " "	22,100	.165	3,646.50	2,928.75
Total Powder	67,568	.146	9,903.27	7,539.96
Elec. Blasting Caps	16,741	.1287 ea.	2,156.12	1,499.13
Connecting Wire	22	.55 lb.	12.10	14.85
#14 Duplex Wire	12,250	18.00 M Ft.	220.50	106.50
#1 Powder Bags	4	1.35 ea.	5.40	8.10
#14 Tinned Copper Wire	550	.196 lb.	107.80	91.99
Total Caps, etc.			2,501.92	1,720.57
Total All Explosives -			12,405.19	9,260.53

4. Mucking:

Eleven or 12 men shoveling or scooping into the 1 cu. yd. tray mucked down the broken rock pile at the rate of about 10 yds. per hour. The speed of the cage hoist was increased at intervals as the shaft deepened to keep pace with the men, running at 1600 ft. per minute after October. The same tray, and I-R air hoist to dump it into the car on the cage, were still in service, plus a smaller tray that was used only when walls were bad and steel had to be carried closer than 18' to the bottom.

A small tumbler scraper powered by the tray hoist was tried as an aid to hand mucking. Its purpose was to muck the center ridge as the men shoveled at the sides. It was successful as far as lifting rock into the tray, but once again chunks in the pile slowed the operation below the rate at which the men worked.

Sinking in rock produced a total of 56,996 cu. yds. to the end of the year. Practically all of this has been dumped south and west of the engine house to form a parking area.

5. Installing Steel:

A total of 184 sets were installed, numbering from 144 at a depth of 1007' to number 327 depth 2289'. The use of the hanging stage set continued, moving it on down the shaft to furnish a working platform and protection for the bottom set of steel. Blasted steel was more of a problem this year in the changing rock formations, the time loss for repairs amounting to a total of 58-3/4 hours.

Damage was usually limited to humped dividers that were straightened and used again. The higher proportion of concrete sets also helped in this respect, particularly when damaged wall plates or end pieces were simply replaced in the same slots by new members.

The 8 sets of 12" bearers were placed at the base of the future level pockets except at the 1900' where the shaft walls were soft ferrugenous slate and were fully concreted. This extra support will back up the shaft steel at the skip loading stations, the points of heaviest impact. The maximum distance between bearers was 182' to the set at 1953', and the minimum 126' to the next below at 2079'.

The same care was used in aligning the steel, using Captain Anderson's accurate and time saving circular disc. Check plumbings were read by the engineering department, usually at the bearer sets, and re-checked at least once. The measurements showed a maximum deviation from the vertical at any corner of 5/8" and an average of less than 1/4". The bottom set of steel, as nearly as can be measured, was 1/4" east and 1/8" north of the collar set, and this small difference was in the process of adjustment at the usual rate of not more than 1/16" per set. Shortly before the end of the year, the 80-lb. steel runners were guaged in the south compartment to a depth of 2240', and it was gratifying to learn that the clearance varied only from 58-5/8" to 58-7/8", or in other words but 1/8" on either side of the 58-3/4" standard.

6. Concreting:

Last year 65 sets were concreted, while in 1942 the number increased to 158. The reason was the blocky wall condition, aggravated below the jasper formation by the soft gouge material following the jointing systems. In order to sink the shaft safely it was frequently necessary to block the walls with wood forepoles which were then removed as the steel and concrete were placed. After July every set was supported on a beveled concrete ring hitched along the irregular walls; and in the softer ferruginous slate and ore formations the set pour was made first, and then the wall sealed entirely by placing concrete back of forms between the first and second sets immediately above.

The total quantity of concrete placed in the shaft amounted to 1074.5 cu. yds. This was subdivided as follows:

	1942	1941	Total Cu.Yds.
Concrete poured to support steel sets	793	251	1044
Concrete poured to seal shaft walls	163	598	761
Sacked concrete placed to block steel sets	8½	15½	24
Sacked concrete for ventilation seal	110	44	154
Total -	1074½	908½	1983

The 598 cu. yds. sealing the walls in 1941 was the solid mass extending from the collar to hitches in the diorite 90' below. The large increase in the quantity of concrete supporting the steel sets was due both to the larger average per set and the increased number of sets. The final figure for the shaft at the 2352' depth is expected to reach a total of approximately 2050 cu. yds. of concrete.

The close attention given the water-cement ratio in mixing high strength concrete was well repaid. The average 28 day strength of all test samples from the shaft to date ran 4350 lb. in compression, and the lowest sample 2900 lb. This has been confirmed by several instances where the steel wall plates or end pieces were bent upward from blasting, and the new members replaced in the concrete slots which remained exactly on line although marred on the edges.

7. Ventilation:

Forced ventilation was supplied through the 14" counterweight pipe by a 5 H.P. Coppus blower on surface. Lengths of ventube extended beyond the end of the steel pipe to maintain delivery of fresh aid within 20' of the bottom. The 5 H.P. fan was replaced in September when the volume had diminished to a little less than 2000 CFM by a 25 H.P. Sturtevant fan later to be used in drifting operations. This again increased the quantity to about 3000 CFM and maintained the low dust count record under which the men have practically been freed from the use of respirators.

Except during warm days, the forced system was supplemented by natural ventilation which varied according to the surface temperature and regulator opening. Immediately after blasting, and with the skip doors opened wide, this volume was allowed to build up so the smoke at times arrived at surface in 7 minutes from depths below 2000', or at a rate of over 21,000 CFM. This air current circulated down the cage road, around the bottom of the partition plates which were usually 40 to 50' above the muck pile, and up the skip compartment carrying off the dust and gas raised by the fan discharge.

The air seal from the ends of the partition plates to the rock walls continued with the use of sacked concrete in forming a masonry wall from set to set. The strength and rigidity of this wall several days after the sacks had been puddled into place is surprising, and they furnish another advantage which may be important, that is in backing up the full length of the studdles between the skip and ladder compartments. This support together with the set pours enclosing the heavy corner studdles secures all four corners of the skip compartment in concrete. Wall overbreak in the lower portion of the shaft required double sacking in some cases, and to date approximately 15,000 sacks 1/2 to 2/3 full of concrete have been used in making this seal.

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8. Pumping:

Shaft water was pumped to surface by 5 automatic I-R 40 g.p.m. centrifugal pumps, each with its own collecting tank at the south end of the ladder compartment. The pumps are stationed at depths of 460, 923, 1385, 1834 and 2261', so arranged that they could be changed in 15 minutes when impellers became worn. The water was pumped from the shaft bottom by air using a small CP7 sludge pump on heads up to about 180'. Allis-Chalmers 5 H.P. 150' head pumps furnished the intermediate size with a double settling tank on the suction to immediately trap as much of the sludge as possible. Tanks were cleaned about twice a week, draining directly into the car on the sinking cage, and the car then dumped by the rotary on surface.

The quantity of water pumped during the progress of the shaft in jasper remained stationary at from 10 to 12 g.p.m. When the shaft entered ore this increased temporarily to about 18 g.p.m., but within several weeks drainage of the immediate area seemed to be complete and the quantity declined to the former level. Another increase occurred in December issuing from open vugs in the graywacke and slates with the total at times reaching nearly 20 g.p.m. The larger inflow came directly from the shaft bottom, under pressure at some points, but with the walls again drying as the shaft deepened. This may presage a change of ground to the tighter formation usually encountered in the footwall.

Pumping difficulties caused by sludge, worn packing, automatic float switch or power failure, etc., were next to damaged steel as the most frequent cause of sinking delays. The total time loss for the year amounted to 26¼ hours, most of it occurring during the lengthier drilling periods when it was most important, yet most difficult, to keep the bottom pumped dry. These 2 causes, damaged steel and pumping, accounted for nearly 75% of the shaft delays, the remainder being due to electrical storms delaying blasting and miscellaneous electrical and mechanical causes of short duration.

9. Construction:

The follow-up construction crew was increased to 5 men under a competent leader. This crew worked on the day shift only, installing corrugated sheets in the skip road, the partition plates between skip and ladder roads, and the concrete sacks for the ventilation seal. They extended air, water and discharge pipes, and looked after the pumps and tank cleaning. On weekends 70' lengths of 14" counterweight pipe were added as needed, and working with the electricians the crew also installed the permanent armored power and signal cables.

Their outstanding job was installation of the 80-lb. rail guides in the skip compartments at a rapid rate. The best progress was made on two 8-hour shifts on a Sunday when 420' of the south com-

partment was fitted by installing 840' of 80-lb. rail including splice bars and the 4 bolt connection at each set on 7' centers.

The rented Lloyd Mine 200 H.P. Ottumwa hoist enabled all this work to go forward without interfering with the regular sinking. Installation of the rail guides will be completed a few days after sinking to 2352', and the next task will be lowering the 10" pump discharge column.

8. COST OF OPENING, EQUIPPING AND DEVELOPING THE MATHER MINE:

Master E&A NM-10 with its various subdivisions numbered as high as NM-10-29 show the estimated and actual costs of the work performed to date. These appear on the following pages, the first showing the sinking, the second and third construction and equipment, and the fourth a summary.

Annual expenditures, in round figures, have been about $1,000,000. in each of the years 1941 and 1942. The 10% reserve for contingencies was partially offset shortly after the estimate date by an approximate 12½% increase in wages. This in turn was balanced by sinking only to 2350' instead of the estimated 2870', so present indications point to the mine entering production with an expenditure of not much more than the $2,621,863 estimated.

a. Shaft Sinking:

The next page shows the sinking expense to date, and the cost per foot for 2271' in rock. The cost of the shaft completed to the 2350' depth is expected to run about 15% above the estimated $248.60 per foot, the latter including the 10% contingency reserve. The two main reasons were the April 1941 wage increase, and reduced overall progress through extra concreting, the cost of this work finally surpassing steel installation.

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	ESTIMATED COST	SUB E&A'S AUTHORIZED NO.	AMOUNT	EXPENDITURE TO 1/1/43	COST PER FT. IN ROCK	AMOUNT UNEXPENDED
1. GENERAL EXPENSE						
Insurance				3,367.91	1.48	
Engineering				10,700.62	4.71	
Geological				2,278.84	1.00	
Analysis				269.13	.12	
Mine Office				9,955.75	4.38	
Central Office				27,123.05	11.95	
Superintendence				21,846.20	9.63	
Legal				299.93	.13	
Personal Inj. Exp.				2,228.48	.98	
Social Sec. Taxes				12,284.78	5.41	
Employees Vaca. Exp.				8,859.96	3.90	
Policing				4,632.88	2.04	
Total -	97,000.00	NM-10-13	97,000.00	103,847.53	45.73	6,846.53
2. MAINTENANCE						
Truck & Tractor				1,246.16	.55	
Buildings				649.02	.29	
Shop Machinery				444.48	.19	
Boilers, Heating				159.53	.07	
Hoisting Machinery				1,492.79	.66	
Compressor & Pipes				1,019.91	.45	
Pumps				3,140.69	1.38	
Total -	9,000.00	NM-10-14	9,000.00	8,152.58	3.59	847.42
3. SINKING IN SAND						
Steel Sets & Lath		NM-10-5	1,511.00	1,438.65		72.35
Drainage Well		NM-10-11	1,896.00	1,896.00		
Sinking	)			10,772.78)		
Timbering	)			1,226.98)		
Concreting & Forms	)			2,449.37)		
Install. Steel Sets	)			609.20)		
Miscl. Expense	)			)		
Compressor	)	NM-10-15	11,593.00	260.78)		4,709.44
Hoisting	)			402.23)		
Sand Disposal	)			287.09)		
Dry House Expense	)			294.01)		
Total -	15,000.00		15,000.00	19,637.09		4,637.09
4. SINKING IN ROCK						
Steel Sets & Lath		NM-10-5	141,683.00	155,415.04	58.34*	13,732.04
Sinking	)			226,574.25	99.77)	
Timbering	)			2,750.83	2.09)	
Concreting	)			40,672.61	17.91)	
Install. Steel Sets	)			38,989.32	17.17)	
Miscl. Expense	)			)	)	
Compressor	)	NM-10-16	396,317.00	16,504.40	7.27)	8,094.67
Hoisting	)			32,406.01	14.27)	
Pumping	)			8,672.26	3.82)	
Rock Disposal	)			17,163.01	7.56)	
Dry House Expense	)			13,442.77	5.92)	
Ventilation Seal	)			5,236.21	2.30)	
Total -	538,000.00		538,000.00	559,826.71	236.42	21,826.71
Cost per foot, 2271' Rock					285.74	
Estimated Cost per foot					248.60	

*The cost per foot includes only the cost of steel installed to the 2320' depth. The total cost of $285.74 per foot of sinking in rock is made up of $338,931.58 (53%) for labor, and $303,687.41 (47%) for supplies. These percentage figures are unchanged from 1941.

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b. Developing & Equipping:

	ESTIMATED COST	SUB E&A'S NO.	AUTHORIZED AMOUNT	EXPENDITURE TO 1/1/43	AMOUNT UNEXPENDED
5. DRIFTING TO ORE BODY					
Equipment	)			13,227.84)	
Drifting	)	NM-10-27	240,000.00	)	
Timbering	)			)	
Total -	240,000.00			13,227.84	226,772.16
6. PLATS AND POCKETS					
Cutting Out 1450'	)			94.71)	
" " 1600'	)			160.51)	
" " 1750'	)			211.71)	
" " 1900'	)			117.78)	
" " 2200'	)			97.34)	
1600' Mech. Devices	)			2,741.34)	
1750' " "	)			2,815.18)	
1900' " "	)			2,372.06)	
Total -	66,000.00	NM-10-28	66,000.00	8,610.63	57,389.37
8. PREPARING SITE					
Roads & Landscaping	5,000.00	NM-10-17	5,000.00	4,561.97	438.03
Move Two Houses	3,458.00	NM-10-2	3,458.00	3,458.00	
Total -	8,458.00		8,458.00	8,019.97	438.03
9. TEMPORARY EQUIPMENT					
Rotary Dump & Cars	)			1,038.56)	
Sinking Cage	)			2,025.80)	
Shaft Pumps	15,000.00)	NM-10-18	15,000.00	4,268.52)	2,191.67
Ventilating Fans	)			545.72)	
Miscellaneous	)			4,929.73)	
Truck & Tractor	18,575.00	NM-10-1	18,575.00	18,289.42	285.58
Temporary Buildings	31,130.00	NM-10-3	31,130.00	26,506.28	4,623.72
Initial Shop Equipm.	5,700.00	NM-10-4	5,700.00	5,732.73	32.73
Total -	70,405.00		70,405.00	63,336.76	7,068.24
10. PERMANENT CONSTRUCTION & EQUIPMENT					
Timber Tunnel & Tracks				11,575.04	
Diesel Crane				6,791.26	
Idler Sheave Stands				2,596.19	
Total -	31,000.00	NM-10-20	31,000.00	20,962.49	10,037.51
11. PERMANENT BUILDINGS					
Headframe					
Structure	154,957.00	NM-10-7	154,957.60	155,977.47	1,019.87
Founda.&Decking	)			17,144.12)	
Heating & Wiring	10,000.00)	NM-10-21	10,000.00	4,368.45)	11,512.57
Docks,Trestles & Pkts.					
Rock Trestle	29,789.00	NM-10-7	29,789.00	29,789.00	
Foundations	1,979.00	NM-10-21	1,979.00	3,917.18	1,938.18
Ore Trestle No. 1	30,000.00	NM-10-21	30,000.00		30,000.00
Foundations	3,000.00	NM-10-21	3,000.00	5,849.97	2,849.97
Main Building					
Main Dry Wing	)	NM-10-10		)	
Power House Wing	259,275.00)	&	268,937.00	279,213.40)	10,276.40
Shop Wing	)	NM-10-19		)	
Office Wing	)			)	
Total -	489,000.00		498,662.60	496,259.59	2,403.01

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	ESTIMATED COST	SUB E&A'S AUTHORIZED NO.	AMOUNT	EXPENDITURE TO 1/1/43	AMOUNT UNEXPENDED
12. EQUIPMENT					
Headframe					
Headframe Elevator		NM-10-12	4,658.00	4,853.00	195.00
9 12-ft. Sheaves				23,227.05	
No. 14 Crusher				11,594.38	
Mechanical Devices				8,434.91	
Power House					
Foundations & Erecting		NM-10-22	164,706.00	32,888.65	33,134.27
Switchboards & Cables				67,484.75	
Motor Generator Set				4,990.48	
Skips and Cages				12,035.72	
Bell Lines & Signals				4,921.74	
Counterweight				14,827.99	
Wire Ropes				17,434.60	
Cage Hoist, Mechanical		NM-10-6	143,000.00	54,000.00	
Skip Hoist, Mechanical		"		89,000.00	
Traveling Crane		NM-10-9	8,500.00	8,894.94	394.94
Cage Hoist, Electrical		NM-10-8	221,783.00	78,461.00	
Skip Hoist, Electrical		"		143,322.00	
Total	542,647.00		542,647.00	576,371.21	33,724.21
Compressor Plant					
Two Compressors				28,108.58	
Motor & Controls				15,881.62	
Foundations				3,532.34	
Air Lines				8,809.86	
Erecting				3,086.22	
Cooling System				1,611.64	
Total -	55,000.00	NM-10-23	55,000.00	61,030.26	6,030.26
Shop Equipment				13,952.40	
Office Equipment				3,364.98	
Change Ho. Equipm.				4,440.96	
Fire Equipment				735.28	
Total -	60,000.00	NM-10-26	60,000.00	22,493.62	37,506.38
Top Tram					
3 Larry Cars				14,545.31	
Total -	40,000.00	NM-10-24	40,000.00	14,545.31	25,454.69
Electric Haulage					
Locomotives				19,620.46	
Cars & Tbr. Trucks				12,459.71	
Haulage Sets				1,760.78	
Total -	90,000.00	NM-10-29	90,000.00	33,840.95	56,159.05
Pumping Plant					
Pumps				10,515.00	
Motor & Control				8,192.48	
Water Column				559.97	
Discharge Line				11,995.54	
Erecting				265.11	
Total -	32,000.00	NM-10-25	32,000.00	31,528.10	471.90
Total Equipment -	819,647.00		819,647.00	739,809.45	79,837.55

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SUMMARY

	ESTIMATED COST	E&A'S AUTHORIZED AMOUNT	EXPENDITURE TO 1/1/43	AMOUNT UNEXPENDED
1. General Expense	97,000.00	97,000.00	103,847.53	6,847.53
2. Maintenance	9,000.00	9,000.00	8,152.58	847.42
3. Sinking in Sand	15,000.00	15,000.00	19,637.09	4,637.09
4. Sinking in Rock	538,000.00	538,000.00	559,826.71	21,826.71
5. Drifting to Ore Body	240,000.00	240,000.00	13,227.84	226,772.16
6. Plats & Pockets	66,000.00	66,000.00	8,610.63	57,389.37
8. Preparing Site	8,458.00	8,458.00	8,019.97	438.03
9. Temporary Equipment	70,405.00	70,405.00	63,336.76	7,068.24
10. Perm. Constr. & Equipm.	31,000.00	31,000.00	20,962.49	10,037.51
11. Permanent Buildings	489,000.00	498,662.60	496,259.59	2,403.01
12. Equipment	819,647.00	819,647.00	739,809.45	79,837.55
Total -	2,383,510.00	2,393,172.60	2,041,690.64	351,481.96
10% for Contingencies	238,353.00			228,690.40
Grand Total -	2,621,863.00	2,393,172.60	2,041,690.64	580,172.36

Sub E&A's approved in 1942 were 10-27 to 10-29 inclusive; for drifting, cutting plats and pockets, and for electric haulage equipment. This left a balance of $228,690.40 in the 10% contingency reserve as the only amount yet unauthorized. Additions to the work originally proposed and increased costs make it appear that this reserve will be needed in all but a few instances.

The estimate of $2,621,863. was to equip and develop the mine to the production stage. Authorization for ordering production equipment came first in 1942 in the form of a 4 cu. yd. shovel to load out of stockpile, and this will soon be followed by an estimate covering the necessary initial underground mining equipment.

9. EXPLORATIONS, PRESENT AND FUTURE:

Diamond drilling to assist in planning upper level development was underway at holes 49, 50 and 51. The 3 holes were located some 2000' east and north of the shaft, all in the NW of the NE of Section 2, to trace ore extensions upward along the footwall. Holes 49 and 50 were successful in locating 44' and 26' of high grade ore respectively, and hole 51 probably skirted the edge of the ore with one 5' run showing 53% iron.

These drill holes together with 16, 39 and the shaft indicate the great lateral extent of the ore in the northern part of the section. Hole 52 was next decided on to trace the westerly course of the deeper ore disclosed in holes 37, 27A and 38. This location is on another east-west line approximately 2000' south of the north section line and about 950' west of hole 38.

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Hole 52 was over 1600' deep on Dec. 31st and is expected to enter the possible ore horizon during the second quarter of 1943.

Opening the 1600' and 1750' plats and drifts will explore the area immediately north of the shaft, and then in turn northeasterly toward holes 49 to 51. Probable extensions of the shaft ore in this direction are awaited with interest.

10. TAXES:

Heavy increases were made by the State Tax Commission in the Mather Mine valuations. Based on the cost of the work completed on the valuation date, the personal property was raised from $20,000 to $175,000. The shaft expenditure plus ore extensions disclosed in holes 49 and 50 were responsible for the big increase in the real valuation from $480,000 in 1941 to $1,125,000 in 1942.

The total taxes paid the City of Ishpeming by the Negaunee Mine Co., including the pipe line parcel in Section 3, are shown below in a comparison for the 2 years. The valuation increase amounted to $800,278, and the tax increase of $27,660.97 was considerably more than the amount paid in 1941.

		1942		1941	
		VALUATION	TAXES	VALUATION	TAXES
Section 2, except N 600' of NE of NE and R's of way	Real	1,125,000.	38,794.84	480,000.	16,953.50
	Personal	175,000.	6,062.75	20,000.	706.40
	Total	1,300,000.	45,037.59	500,000.	17,659.90
	Coll. Fee		450.38		176.60
	Total		45,487.97		17,836.50
Mather Mine Pipe Line, parcel in Section 3, 47-27		600.	20.77	322.	11.37
	Coll. Fee		.21		.11
	Grand Total	1,300,600	45,508.95	500,322.	17,847.98

11. ACCIDENTS AND PERSONAL INJURY:

It is a great pleasure to report that at the time of this writing the shaft has been completed at a depth of 2352' with but one lost time accident which occurred December 12, 1941 when a shift boss fell, breaking his ankle. This man returned to work in May and has had charge of his shift regularly since that time. The establishment of the 13 month no-accident sinking interval was due to the help

and interest that every shaft miner displayed in his own and the work in general. Credit is due the captain, bosses, and men alike in maintaining constant protection under wall conditions which at times were exceedingly hazardous. The stage set provided a means of blocking the side walls until steel and concrete were in place, and sinking speed was made secondary to safety and permanency when these conditions were encountered.

The surface crew also deserves credit for the safe handling of the hundreds of carloads of equipment and supplies received since the opening of the mine, and for their protection of the underground men during removal of the temporary headframe and outfitting of the permanent structure. Their record to the end of the year stood at 688 days worked without a lost time accident.

The number of surface and underground man days worked in 1942 without injury amounted to 26,930. The underground period approached 13 months, and the surface 27½ months.

12. NEW AND PROPOSED CONSTRUCTION:

Surface and underground construction including headframe, trestles, pipe line, timber tunnels, shaft, etc., have already been described under previous headings, and the costs are shown in section 8. Construction proposed in 1943 is the immediate opening of the 1600' and 1750' levels when sinking is finished in January. Cutting the plats and pockets on these levels is expected to be underway through April, to be followed by drifting north and then east in the footwall. A small amount of drifting is also planned on the 2350' level to provide for handling skip spillage.

The sub E&A's carrying the costs of the above operations are NM-10-5 and 10-6. The expense for the short drifts north of the shaft, and some equipment charges such as air cylinders, drifter drills etc. have already been entered in these accounts.

13. EQUIPMENT:

The original estimates of the cost of temporary and permanent equipment to be used in developing the mine to the production stage amounted to $890,052, plus a 10% contingency reserve. Contract payments on the larger items such as hoists, electrical equipment, compressors, etc. have been completed. Still to come forward, but with definite shipping dates promised, are additional cars and locomotives, building equipment, etc., and it now appears that the estimate will about cover requirements. Not included in this figure however, are purchases such as sinker and drifter drills, mucking machines, and so on which are charged to their separate sinking or drifting accounts.

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The first equipment E&A for the production stage was a sizable one covering a 4 cu. yd. electric shovel for loading out of stockpile. Anticipating possible difficulty in obtaining a shovel, the order was placed early with the Bucyrus-Erie Co. for a special long boom 120-B to work safety under the 60' height of stockpile. The E&A number was NM-18 and the amount $85,000.00. Necessarily soon to follow will be an estimate for drilling machines, scrapers, hoists, etc., for the initial underground mining equipment.

14. MAINTENANCE AND REPAIRS:

The new buildings and machinery practically limited this work to the equipment used in shaft sinking operations. Pumps, drilling machines and tractor and truck repairs were the larger items, the pumps particularly because of the continual sludge wear on packing, pistons and impellers. This expense was held down by sending the worn impellers to the central shops to be welded, machined and balanced. In this way only 4 new sets were used on the 2-stage pumps in over a year's time.

Two heavy repair jobs were necessary on the D-8 Tractor used for hauling rock from the shaft. The tracks and roller assemblies required parts costing over $400. last spring, and in September a defective bearing broke and ruined the gears on one side of the final drive before the machine could be stopped. Hoisting machinery maintenance included repairing the rented hoist and the sinking cage, as well as replacing wear shoes on the latter. The list of expense for the year 1942 follows:

Truck & Tractor	$1246.16
Buildings	304.80
Shop Machinery	303.55
Hoisting Machinery	664.84
Compressors & Air Lines	22.71
Pumps	1964.91
Total Maintenance 1942 -	$4506.97

15. POWER:

Consumption of electric power was more than 3 times that of last year, increasing from 442,000 to 1,510,830 K.W. hrs. All factors tended toward this large increase such as the deepening shaft, use of the large cage hoist and flywheel set after January, testing the larger skip hoist, increased lighting in the new buildings, shop machinery, etc. The average maximum 15 minute demand was held to about double that of last year at 325 K.W. compared to 165, so the average price per K.W. hr. after April was 1.38¢ as against 1.60¢. The following table lists consumption and rates:

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CONSUMPTION 1942 K.W.Hrs.	AVERAGE MAX. DEMAND	AVERAGE DEMAND FACTOR	COST OF CURRENT	AVERAGE PRICE PER K.W.HR.
1,510,830	325 K.W.	47%	$23,448.14	$.0155

16. WATER SUPPLY:

The City of Ishpeming delivered water for the mine through the 6" main from the corner of Wabash and 7th Streets. Consumption for the year amounted to 2,487,000 gallons and the cost $231.36. The water was used for all purposes except as a supplement in the shaft where wall drainage collected in a reservoir tank at a depth of 550', and a float valve admitted the city water only when shortages developed during exceptionally long drill periods.

18. NATIONALITY OF EMPLOYEES:

	American Born	Foreign Born
American	18	
English	4	3
Finnish	25	6
Canadian	2	1
Swedish	5	1
Norwegian	7	
Irish	2	
Danish	1	
Italian	7	
Austrian		1
Total -	71	12
	85½%	14½%

MORRIS MINE

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1. GENERAL

The Morris Mine in 1942 produced more ore than in any year since the Inland Steel Company acquired the lease, with the sole exception of 1937, in which year the output was 425,958 tons.

The property operated 289 shifts compared with 254½ in 1941. For some time the operating schedule was 2 - 8 hr. shifts five days per week. On April 18, 1942, this was changed to 6 days per week. Prior to April 18 this year, the working time for each man was limited to forty hours per week.

Shipments in 1942 did exceed the year before but 1940 still shows a top figure of 427,258 tons.

The ore reserves show a shrinkage of 145,240 tons but it should be borne in mind that the increase in tonnage last year compared with the year before that was 1,102,708 tons. Although the total for the period ending December 31, 1942 shows a decrease for the entire mine, the ore reserves on our own fee lands increased by 96,744 tons.

A new 60,000 cu. ft. Jeffry "Aero Dyne" ventilating fan was purchased and installed at the top of the air shaft which is located southeast of the office, a short distance to the west of the main county road.

The deep well pumps removed about 4,432,000 tons of water from the overburden around the caved area.

There was a tapering off of about 310 G.P.M. in the gallonage pumped from the surface wells compared with 1941.

The underground weir readings show a decrease of 55 G.P.M. on the year's average flow.

The operating cost as near as can be estimated increased from $1.8281 per ton in 1941 to $2.0011 in 1942.

2. PRODUCTION SHIPMENTS & INVENTORIES

a. Production

Grade	Tons	% of Total
Morris Standard	307,303	76.6%
Morris Silicious	93,693	23.4%
Total	400,996	100.0

2. PRODUCTION
SHIPMENTS &
INVENTORIES (Cont.)

a. Production (Cont.)

	Leased Lands	Fee Lands	Total Tons
Morris Standard	262,687	44,616	307,303
Morris Silica	76,614	17,079	93,693
Total	339,301	61,695	400,996
	84.6%	15.4%	100.0%

The following tabulation shows the tonnage produced from the Chase Leases and the old Excelsior Iron Company's fee lands since 1933:

	Leased Lands		Fee Lands	
Year	Tons	% of Total	Tons	% of Total
1942	339,301	84.6	61,695	15.4
1941	310,646	88.6	40,119	11.4
1940	280,242	80.8	66,685	19.2
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	180,649	51.9	166,752	48.1
1935	184,447	75.2	61.013	24.8
1934	129,284	74.6	43,985	25.4
1933	103,487	82.0	22,709	18.0
Grand Total	2,156,109	73.5%	778,929	26.5%

Summary

Product from Leased lands 1933-1942	2,156,109 tons
Product from Fee lands 1933-1942	778,929 "
Total	2,935,038 tons

b. Shipments

Ore shipped from pocket and stockpiles for 1942 was as follows:

Grade	Pocket Tons	Stockpile Tons	Total Tons
Morris Standard	167,138	139,963	307,101
Morris Silicious	32,876	56,794	89,670
Total	200,014	196,757	396,771

2. PRODUCTION
SHIPMENTS &
INVENTORIES (Cont.)

b. Shipments (cont.)

Shipments in 1942 did exceed the 1941 tonnage but to date 1940 shows the largest tonnage forwarded to Indiana Harbor and ore shipped on our account.

Year	Standard Ore	Silicious Ore	Total Ore
1942	307,101	89,670	396,771
1941	270,211	64,052	334,263
1940	314,407	112,851	427,258
1939	332,987	57,256	390,243
1938	199,459	40,459	239,918
1937	250,467	88,577	339,044
1936	236,661	64,274	300,935
1935	181,232	36,624	217,856
1934	110,955	45,565	156,520
1933	63,255	13,301	76,556
Total	2,266,735	612,629	2,879,364

Summary

Standard ore shipped 1933-1942	2,266,735
Silicious ore shipped 1933-1942	612,629
Total	2,879,364

c. Ore in Stock

Stockpile balances as of December 31, 1942 were:

Morris Standard Ore	25,970
Morris Silicious ore	29,705
Total	55,675

e. Production by Months for 1942

Month	Shifts Operated	Morris Standard	Morris Silicious	Total Production
January	20	20,603	5,209	25,812
February	20	20,431	6,655	27,086
March	22	23,004	7,035	30,039
April	24	27,355	5,550	32,905
May	25	31,547	5,631	37,178
June	26	27,206	11,145	38,351
July	26	25,739	11,185	36,924
August	26	28,785	7,330	36,115
September	25	29,313	7,507	36,820
October	27	24,907	9,892	34,799
November	24	23,016	8,065	31,081
December	24	25,397	8,489	33,886
Total	289	307,303	93,693	400,996

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2. PRODUCTION
SHIPMENTS &
INVENTORIES (Cont.)

e. Production by Months (Cont.)

Some of the following data is approximate only, as we do not have access to enough detailed information to arrive at exact figures.

Month	Average Daily Product	Total Tons Per Man Per Day	Number of Men Employed
January	1,291	5.91	216
February	1,355	6.32	214
March	1,366	6.38	214
April	1,371	6.46	212
May	1,487	6.95	214
June	1,475	6.79	214
July	1,420	6.31	224
August	1,389	6.07	228
September	1,473	6.43	229
October	1,288	5.60	230
November	1,295	5.44	238
December	1,412	6.03	234
Yearly Average	1,387	6.22	222

Comparative data for 1941 and 1942 shows this comparison:

Year	Average Daily Product	Tons Per Man Per Day	Average No. Men Employed
1941	1,378	6.42	214
1942	1,387	6.22	222

f. Delays

About 1500 tons was lost on the 29th and 30th of January when a skip runner broke at 3:30 P.M. on the afternoon of the 29th. About 700 ft. of rope piled up on the top of the North skip. Production was delayed three shifts before repairs were completed.

3. ANALYSIS

Shipments

The combined analysis of the ores as sampled and analyzed by the Inland Steel Company for 1942 follows:

	Natural Analysis					
	Iron	Phos.	Silica	Mang.	Alum.	Moist.
Morris Standard	52.38	.077	7.46	.44	2.19	11.73
Morris Silicious	46.20	.065	17.21	.34	2.72	10.37

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3. ANALYSIS (Cont.)

Stockpile Analysis

The ore in stock average Iron and Phosphorus was reported to us as indicated:

	Average-Natural Analysis					
	Tons	Iron	Phos.	Sil.	Mang.	Moist.
Morris Standard	25,970	52.68	.069	7.26	.45	11.73
Morris Silicious	29,705	46.27	.065	16.28	.33	10.50

Analysis of Ore Reserves

	Expected Natural Analysis							
	Tons	Iron	Phos.	Sil.	Mang.	Alum.	Sul.	Moist.
Morris Standard	2,901,817	51.98	.076	8.70	.44	2.27	.013	11.50
Morris Hi-Sulphur	95,777	52.62	.106	7.18	.39	2.27	.456	10.50

4. ESTIMATE OF ORE RESERVES

	Ore Reserves as of Dec. 31,1942	Ore Reserves as of Dec. 31,1941	Difference
C.C.I.Co.Lands	622,805	526,061	+ 96,744
Chase Lease #9	1,791,867	2,038,647	- 246,780
" " #24	427,732	463,708	- 35,976
" " #25	33,273	33,273	-
" " #26	26,140	26,140	-
Total	2,901,817	3,087,829	-186,012
High Sulphur Ore			
Chase Lease #24	95,777	55,005	+ 40,772
Grand Total	2,997,594	3,142,834	- 145,240

Detail of Ore Estimate

C.C.I.Co. Lands	
Above 7th Level, #21 Deposit	26,538 tons
Above 7th Level, #81 Deposit	3,210 "
Above 8th Level, #21 Deposit	8,427 "
Above 8th Level, #33 (Main) Deposit	193,833 "
Above 8th Level, #76 Deposit	8,100 "
Above 9th Level, #33 Deposit	359,725 "
Above 9th Level # 76 Deposit	8,437 "
Below 9th Level, #33 Main Deposit	14,535 "
Total C.C.I.Co. Lands	622,805 tons

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4. ESTIMATE OF ORE RESERVES (Cont.)

Detail of Ore Estimate (Cont.)

Chase Lease No. 9	
Above 7th Level, #21 Deposit	3,310 tons
Above 7th Level, #61 Deposit	13,729 "
Above 7th Level, #78 Deposit	5,250 "
Above 8th Level, #33 Deposit	334,461 "
Above 8th Level, #61 Deposit	31,926 "
Above 8th Level, #75 Deposit	223,186 "
Above 8th Level, #76 Deposit	31,965 "
Above 8th Level, #78 Deposit	8,672 "
Above 8th Level, #83 Deposit	15,177 "
Above 9th Level, #33 Deposit	720,338 "
Above 9th Level, #75 Deposit	206,253 "
Above 9th Level, #76 Deposit	33,938 "
Below 9th Level, #33 Deposit	126,178 "
Below 9th Level, #75 Deposit	37,484 "
Total Chase Lease No. 9	1,791,867 tons
Chase Lease No. 24	
Above 7th Level, #35 Deposit	1,477 tons
Above 7th Level, #62 Deposit	6,092 "
Above 7th Level, #63 Deposit	5,503 "
Above 7th Level, #75 Deposit	14,279 "
Above 7th Level, #80 Deposit	4,939 "
Above 8th Level, #33 Deposit	6,006 "
Above 8th Level, #62 Deposit	8,353 "
Above 8th Level, #63 Deposit	10,041 "
Above 8th Level, #75 Deposit	123,736 "
Above 8th Level, #79 Deposit	7,582 "
Above 9th Level, #82 Deposit	11,527 "
Above 9th Level, #33 Deposit	82,629 "
Above 9th Level, #79 Deposit	15,375 "
Above 9th Level, #82 Deposit	113,819 "
Below 9th Level, #33 Deposit	16,374 "
Total Chase Lease #24	427,732 tons

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4. ESTIMATE OF ORE RESERVES (Cont.)

Detail of Ore Estimate(Cont.)

Chase Lease #25	
Same as in the 1940 and 1941 annual reports	33,273 tons
Chase Lease #26	
Same as in the 1940 and 1941 annual reports	26,140 "
High Sulphur Ore	
Above 8th Level, #79 Deposit	16,192 "
Above 9th Level, #79 Deposit	38,813 "
Above 9th Level, #82 Deposit	10,657 "
Below 9th Level, #82 Deposit	30,115 "
Total	95,777 tons
Grand Total All Ore Bodies	2,997,594 tons
Ore in sight December 31, 1941	3,142,834 "
Ore in sight December 31, 1942	2,997,594 "
Decrease	145,240 tons
Standard ore produced in 1942	307,303 tons
New ore developed in 1942	162,063 "

6. SURFACE

New Fan
A new Jeffry "Aerodyne" 60,000 cubic foot fan was installed at the air shaft. The old fan had a capacity of 38,000 cu. ft. of air per minute.

Timber Yard
In the timber yard to the north of the shaft, a strip 75' to 100' wide was cleared in the swampy area west of the yard. The trees and brush were removed, back filled with sand and a new 4" water pipe provides better fire protection.

Flood lights
Numerous flood lights were installed at various points on the mine surface.

Fencing
The area including the mine offices, dry, shops and engine house was fenced, gates and turn-stiles installed and a gate keeper or watchman provided for the main gate put across the main road.

Shops
New ceilings, cutting off the triangular space under the roof trusses, were put up in the shops. Fluorescent lights were installed.

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6. SURFACE (Cont.)

Shops (Cont.)
The old line shafting driving the shop machinery was removed and individual motor drives installed on each piece of shop equipment.

To complete the shop modernization, a new overhead crane was purchased.

Deep Wells, Pumps and Test Holes
Test Holes:
Two new test holes, #529 and #530, were drilled by the Layne-Northwest Company. These are located North of the L.S.& I. main line to the Northwest of the shaft. Hole #529 is about 700' distant and #530 - 1400' from the Morris shaft.

The following tabulation indicates how the water level has been lowered over the surface area

Test Hole	Sea Level Elevation Jan. 1st 1942	Sea Level Elevation Dec. 31st 1942	Feet Lowered in 1942	Depth Remaining to Ledge
#501	1457.8	1453.8	4.0	56.9
503	1438.6	1434.6	4.0	136.6
504	1436.2	1438.3	-2.1	87.9
505	1463.4	1458.9	4.5	94.1
506	1454.9	1447.4	7.5	41.7
507	Dry	Dry	-	Dry
508	1413.6	1415.4	-1.8	63.6
509	1422.7	1417.3	5.4	114.1
510	1444.5	1446.4	-1.9	92.3
511	1452.1	1445.7	6.4	130.3
512	1436.7	1430.2	6.5	108.8
513	1466.4	1465.0	1.4	140.8
514	1461.0	1454.9	6.1	103.8
515	1471.3	1466.2	5.1	109.5
516	1472.4	1472.8	-0.4	21.6
517	1451.3	1445.3	6.0	90.7
518	1397.2	1400.5	-3.3	77.1
519	1405.2	1406.8	-1.6	94.8
520	1391.4	Dry	-	Dry
521	1377.3	Dry	-	Dry
522	1359.5	1356.9	2.6	8.9
523	1423.3	Dry	-	Dry
524	Plugged	1468.3	?	123.2
526	1414.3	1415.8	-1.5	96.2
527	1431.5	1432.4	-0.9	71.8
528	1439.4	1441.4	-2.0	100.1
529	Dry	Dry	-	Dry
530	Dry	Dry	-	Dry

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6. SURFACE (Cont.)

Test Holes (Cont.)
The foregoing data shows that the area to the south of the caves has dried up. There is no water left on top the ledge northwest of the shaft. Down in the Southwest corner of the property, a half mile away from the shaft, near the old drainage ditch that we excavated to carry the water from the Barnes Hecker Mine, the water level has risen on the average about two feet.

Deep Well Pumps
During the year surface pumping was continued from Deep Wells Nos. 1, 2, 3A, 4, 5, 6, 7 and 8. The two small pumps also operated intermittently in the two caves. This surface pumping cost as follows:

Capital expenditures	$ 9,555.60
Operating, Labor & Power	19,392.00
Total	28,947.60

An average of 2267.6 gallons of water per minute was pumped, which amounts to 4,432,192 gross tons of water.

The detail that follows shows the pumping rate of the various wells for the year, viz:

	Jan.	Feb.	March	April	May	June
Pump #1	240	240	240	216	210	210
#2	100	98	-	77	80	90
#3A	962	910	946	970	993	952
#4	-	73	76	70	60	-
#5	330	300	286	275	282	285
#6	155	147	140	138	137	135
#7	519	524	38	32	30	-
#8	-	-	510	495	505	500
Cave #1	-	12	40	13	10	10
Cave #2	-	20	60	22	20	25
Total	2,306	2,324	2,336	2,308	2,327	2,207

	July	Aug.	Sept.	Oct.	Nov.	Dec.
Pump #1	210	210	-	-	-	236
#2	80	100	105	102	100	95
#3A	960	960	967	880	940	858
#4	60	60	60	55	40	35
#5	280	321	360	340	330	364
#6	134	145	145	140	140	136
#7	30	30	30	20	15	10
#8	497	497	510	505	495	500
Cave #1	8	8	8	8	8	-
Cave #2	25	25	25	25	27	-
	2,284	2,356	2,210	2,075	2,095	2,234

Yearly average - 2,267.6 G.P.M.

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6. SURFACE (Cont.)

Deep Well Pumps (Cont.)
The average G.P.M. for 1941 was 2,576 so that there was a slackening off of about 310 gallons.

There were no new wells developed in 1942 although #8 did not actually start pumping until March. No. 1 well was deepened.

7. UNDERGROUND

The water flowing into the mine again, as in 1941, shows a gradual decrease.

WEIR READINGS

Month	4th	6th	7th	8th	9th	TOTAL
January	86.0	43.1	312.0	252.8	198.0	891.9
February	86.0	40.5	309.0	244.5	188.0	868.0
March	75.0	41.5	292.1	253.1	239.9	901.6
April	70.5	39.5	280.3	273.4	195.0	858.7
May	68.0	39.5	269.3	262.0	181.6	820.4
June	66.3	38.6	264.0	252.6	172.0	793.5
July	73.2	39.1	259.7	286.4	174.9	833.3
August	82.4	39.6	257.6	271.8	166.3	817.7
September	74.8	39.1	266.3	310.8	175.5	866.5
October	80.4	42.0	278.3	281.1	165.8	847.6
November	84.0	40.3	271.5	271.1	160.0	826.9
December	90.1	39.4	253.3	301.4	141.2	825.4
Yearly average						844.0

Comparison with previous years follows:

Year	
1942	844
1941	899
1940	1,158
1939	788
1938	568
1937	360

Developing
The new development during 1942 consisted of drifting and raising on and above the 8th and 9th Levels.

On the east side of the 8th Level, on our fee lands, 850 feet of drifting was done to develop the ore found by diamond drill holes #6 and #8.

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7. UNDERGROUND (Cont.)

Developing (Cont.)
This drift proved very disappointing because the ore expected from the diamond drill holes was not found. To date only 60 ft. of ore was uncovered and this is now being developed for a small stope.

In the 8th Level footwall drift, a new raise going up to and above the 7th Level will permit mining #61 deposit. Furthermore, this raise can be used to divert the water now coming into the mine on the west end of the 7th Level.

On the -220 ft. sub level, exploring cross cuts running north and south and drifting on the west end of this sub further increased the extent of the main or #33 deposit.

On the 9th Level, the main footwall drift was advanced 225 ft. and a crosscut 125 ft. long driven to the south about 200 ft. west of the east line of Chase Lease #24. No ore was cut but raises from this crosscut will be used to mine the 8th Level hi-sulphur ore.

The southwest drift on the 9th was extended 320 ft., the breast of the drift stopping at diamond drill hole #7. The ore found in this drift south of the dike was badly contaminated by sulphur in the form of gypsum. A raise put up from the south side of this drift ran out of this high sulphur ore a short distance above the level.

Stoping
Most of the ore mined in 1942 came from the sub level slicing gangs. In fact there never were over two contracts sub level stoping at any one time.

Sub Stoping
In the west end of the #75 deposit, on the extreme west side of Chase Lease #9, and on Lease #24, one area 220' long with a minimum width of 80' was stoped from the +120' to the +20' elevations.

Slicing Areas
C.C.I.Co. Fee Lands

No. 33 or Main Deposit
Over on the east end of the property, in the top portion of No. 33 deposit, two slicing gangs, #7 and #13, mined out the +10' sub and about half of the 000 sub in the extreme east crotch and the -40', -30' and the -20' subs adjacent to the east line of Chase Lease #9.

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7. UNDERGROUND (Cont.)

Slicing Areas (Cont.)
#33 Deposit
On the -30' sub level, at the top of a new raise, the first drift was driven east along the 3600 south coordinate line preparatory to slicing this ore which lies north of the area mined out by #13.

South of Chase Lease #9, an area two slices wide and 120 ft. long in the south central part of the main deposit,was sliced on the -40 sub, On the -50 and -60 subs, this same area was also mined out and the width increased to 40'.

On the -100 and -110 ft. sub levels, close to the 8th Level, two other areas straddling the 2200 and 2400 west coordinate lines were sliced out.

The lowest workings on which ore was sliced in the extreme south west corner of the mine was the main 8th Level. An area 300 ft. long was opened up and by the end of the year five parallel slices had been taken 275' east of the east line of Chase Lease #24.

Chase Lease #9
No. 33 or Main Deposit
The top sub sliced in the east end of the main deposit was -50 sub and the lowest -130, which is one sub below the 8th Level. The Main deposit striking east and west for a distance of one quarter of a mile is divided into blocks or mining limits established and allocated to various mining gangs. These blocks are usually 150 ft. long. The gangs on the west end are mining nearly 200 ft. lower down than those over near the east side. On the average, there were eight slicing gangs assigned to the various blocks.

No. 75 Deposit
Slicing in this deposit was carried on at various elevations beginning at the +70 at the top and ending at the -20' elevation. The contracts in this deposit sliced from the 1500 west coordinate line to the 2450 west line but mining was confined to two gangs on the east side and one on the west end.

Chase Lease No.24
Near the end of the year slicing was started on the 000 sub in #75 deposit under the old stope. Because of the hanging rock sluffing off and contaminating the standard ore broken in the sub stope, it was decided to discontinue stoping and slice the remainder of this deposit.

In the southwest corner of the main deposit, although no slicing was actually done in 1942, raises and drifts preparatory to slicing were finished.

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7. UNDERGROUND (Cont.)

Diamond Drilling

Diamond drill hole #8 on the 8th Level was drilled southeasterly from a station 700 ft. south of the shaft. The drill hole struck 125 ft. of high grade ore which, from subsequent development work done, appears to be below the 8th Level.

8. COST OF OPERATING

	1941	1942
Operating-Labor	.8803 per ton	1.1008 per ton
Operating-Supplies	.5215 "	.5329 "
Repairs	.0432 "	.0355 "
Loading and Shipping	.0560 "	.0560 Est.
Safety & Welfare	.0120 "	.0120 "
Development	.0800 "	.0800 "
General Expense	.2351	.1839
Cost of production	1.8281	2.0011
Increase in 1942		.1730

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1. GENERAL

Efficiencies were again higher in 1942 at the Tilden Mine in all operations accomplished by Company men and equipment. Drilling, blasting and loading in direct shipments marked up a satisfactory rise in performance in all three departments.

Shipping from the property started on March 28th, 1942 and ended for the season on November 23rd with a total of 241,537 tons shipped. Production for the year amounted to 235,207 tons. Of the total production sixteen percent was made up of Low Phosphorus ore in which operation only one shovel can be utilized. The tonnage obtained per shift in this limited ore selection was increased by six percent over the 1941 mark despite the fact that the Low Phosphorus demands were four times higher this year than last. The low tonnage phase of this East Pit production will be eased in the future by the opening of a second bench in this area during the past season.

Primary drilling obtained a high footage of 8,889 feet this year with an increase of nineteen percent in net footage per shift, and also demonstrated a higher footage per bit. Drilling costs for 1942 were the lowest in the use of nine inch holes at the property.

Primary blasting produced 440,000 tons at a cost per ton again slightly lower this year than formerly, substantiating the trend in Tilden blasting policy towards high ammonium nitrate powders as against gelatin dynamites.

The new No. 52 shovel, a Bucyrus Erie 120-B type, was placed in operation late in July and loaded ore very satisfactorily to the close of the season. Late in the year the shovel stripped the south side of the Lower Bench West Pit.

New haulage equipment in the form of two Euclid fifteen ton trucks serviced the Lower Bench area very efficiently and performed excellently with the No. 52 shovel in the stripping project. The use of these haulage units in stocking ore is contemplated for the 1943 season inasmuch as stocking operations and consequently all shovel and haulage operations incident to stocking were very seriously impaired this past season by extremely inadequate private truck rental service. The decrease in output per shovel shift this year for the entire operation can be attributed directly to this fact, and to a lesser degree on the one shovel, East Pit loading.

Two large stripping projects were accomplished during the winter in the East Pit advancement area and along the south side of the West Pit.

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2. PRODUCTION SHIPMENTS & INVENTORIES

a. Production by Grades

	Tilden Silica	Low Phosphorus	Total
West Pit	193,544	- -	193,544
East Pit	60,248	39,039	99,287
Total	196,168	39,039	235,207

b. Shipments

Shipments for this property totalled 241,537 tons leaving a balance on hand of 52,483 tons on stock.

Tilden Silica	202,498
Tilden Low Phos.	39,039
Total	292,443

C. Stockpile Inventories

Ore was stocked at the Tilden Mine in 1942 for the third year. The tonnage stocked by grades, is given below;

	1942	1941	1940	In Stock Dec. 31, 1942
Tilden Silica	47,990	48,629	31,241	32,338
Tilden Low Phos.	- -	3,073	10,742	13,815
Total	47,990	51,702	41,983	46,153

The total cost of stocking 47,990 tons of ore was $3,093.89 or $.064 per ton. In 1941, 51,702 ton were stocked at a cost of 2,557.91 or $.049 per ton. The Increase per ton due to higher rental charge for trucks and a decreased daily product because of inadequate truck service.

A total of 60,286 tons was loaded from the stockpiles at a cost of 1,494.19, or .024 per ton, as compared with a shipment of 41,202 tons in 1941 at a cost of .01 per ton. The overall cost of stocking and loading from the stockpiles was .088 per ton in 1942 as against .066 per ton accomplished in 1941. It was necessary in 1942, beacuse of the greater tonnage involved, to load from the south stocking ground track where the services of a switch engine were neceasary. Had this switching charge of 345.83 been avoided the loading costs for 1942 and 1941 would have been comparable.

d. Broken Ore Reserves

The book figures of the broken ore reserves are as follows:

East Pit	183,000
W½ of West Pit	67,429
E½ of West Pit	12,419
Total	262,848

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2. PRODUCTION SHIPMENTS & INVENTORIES (CONT.)

e. Products by Months

Month	Days Operated	Average Tonnage Per 8 Hr. Shift	Total Tons
May	14 (14-1-8)	1,592	22,293
June	22 (22-1-8)	2,135	46,988
July	34 (14-1-8) (1-2-8) (6-3-8)	1,797	61,183
Ausust	14 (8-1-8) (3-2-8)	2,013	28,239
September	33 (5-3-8) (18-1-8)	1,415	46,713
October	23 (6-1-8) (4-2-8) (9-1-8)	1,294	29,770
November		~~21~~	21
Total	140 (1-8 Hr.)	1,680	235,207

The average daily output of 1,680 tons in 1942 compares with 2,033 tons in 1941, 1,787 tons in 1940 and 1,980 tons in 1939.

Month	West Pit	East Pit
May	12,953	9,340
June	32,966	14,022
July	28,988	32,195
August	18,370	9,869
September	22,535	24,178
October	20,087	9,683
November	21	
Total	135,920	99,287

The proportion of total production by months to shipping and stocking is given below:

Month	Tonnage Shipped	Tonnage Stocked
May	11,742	10,551
June	39,392	7,596
July	61,183	
August	28,239	
September	33,742	12,971
October	12,898	16,872
November	21	
Total	187,217	47,990

Ore shipped from stockpiles by months:

March	5,966
April	12,739
May	13,583
November	22,032
Total	54,320

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2. PRODUCTION
SHIPMENTS &
INVENTORIES (CONT.)

f. Ore Statement

	1942 Tons	1941 Tons
On Hand January 1, 1942	52,483	41,983
Output for year	235,207	302,943
Total	287,690	344,926
Shipments	241,537	292,443
Balance on hand	46,153	52,483
Decrease in Output	67,736	
Decrease in Shipments	50,906	
Tons stocked	47,990	51,702
Decrease in Tonnage Stocked	3,712	

1936 77-1-8 Hour Shifts and 57-2-8 Hour Shifts - Total 191-1-8 Hour Shifts
1937 113-1-8 Hour Shifts and 20-2-8 Hour Shifts - Total 153-1-8 Hour Shifts
1938 40-1-8 Hour Shifts and 0-2-8 Hour Shifts - Total 40-1-8 Hour Shifts
1939 78-1-8 Hour Shifts and 4-2-8 Hour Shifts - Total 86-1-8 Hour Shifts
1940 107-1-8 Hour Shifts and 4-2-8 Hour Shifts - Total 115-1-8 Hour Shifts
1941 141-1-8 Hour Shifts and 4-2-8 Hour Shifts - Total 149-1-8 Hour Shifts
1942 91-1-8 Hour Shifts and 11-3-8 Hour Shifts
8-2-8 Hour Shifts - Total 140-1-8 Hour Shifts

As was pointed out in the annual report for 1941, the excellent average daily output for that year was due primarily to the fact that 96 % of the total output consisted of Tilden Silica Ore, the production of which utilized to the fullest extent the production capacity of the Tilden equipment as compared to a Low Phosphorous production which entails the use of one shovel only in the East Pit.

The Year 1942 contrasted sharply with 1941 in that the percentage of Low Phos. production was four times as great, 16% as compared to 4 % in 1942. It may be pointed out here that the daily production per shovel shift on Low Phos. Ore was lifted greatly in 1942, being 1,148 tons as against 1,077 tons in 1941. This gratifying rise in efficiency could not, however, affect the production factor mentioned above.

Further, of the total 1942 production, 20 % was placed on the stockpile, as against 17 % in 1941. Inadequate truck rental service engendered by war time economic conditions slowed the output at the crusher pocket placing forced delays on the shovels, this undesirable condition was reflected in an average daily tonnage stocked of 1,297 tons.

As contrasted against these above mentioned hampering features of Low Phos. production and unfavorable stocking conditons, the month of June during which these features were absent, had an average daily output of 2,135 tons.

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2. PRODUCTION SHIPMENTS & INVENTORIES (CONT.)

g. Delays

For the second successive year a reduction in lost time chargeable to delays was attained in 1942. The percentage of estimated loss of product due to delays was reduced last season as noted below

Year	Percentage estimated loss of product
1940	4.6 %
1941	3.1
1942	2.0

There were no extensive individual delays during the year and the total delays chargeable to the various equipment are given below.

Equipment	Hours	Estimated Loss of Product	Total
Crushing Plant			
(a) Electrical storm	3½	415 tons	
(b) Other causes	6	1,519 "	1,934 tons
Power shovels	23		2,471
Locomotives	9		329
Total	41½		4,734

h. Delays from Lack of Current

Three and one half hours were lost at the property because of precautions taken to shut down the crushing plant during severe electrical storms to avoid the possibility of the current breakers throwing out while the crusher were under load. Neglect of this precaution would necessitate unloading of the crusher by hand shovel.

3. ANALYSIS

a. Average Mine Analysis on Output

Grade	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul	Loss on Ignition
Tilden Silica	39.72	.035	41.38	.09	.90	.20	.22	.009	.24
Til. Low Phos	37.87	.016	44.08	.09	.53	.20	.17	.009	.34

b. Average analysis on Straight Cargoes

	Mine			Lake Erie		
	Iron	Phos.	Sil.	Iron	Phos.	Sil.
Tilden Silica	39.52	.034	41.77	39.90		1.88
Tilden Low Phos	37.84	.016	44.02	38.17	.014	1.63

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4. ESTIMATE OF ORE RESERVES

a. Developed Ore

1. West Pit

In the West Pit ore reserves and stripped reserves are the same inasmuch as present conditions do not permit additional stripping in this area. A statement of the reserves is given below:

Assumption: 13 cu. ft. equal one ton

Total developed ore as of January 1st, 1943 — 1,606,154 tons

Blasting in the West half of the upper Bench was completed in 1942 and no further mining can be done in that area. Approximately 90,000 tons can be expected to be recovered in the East half upper Bench.

2. East Pit, including Summit Pit

Assumption: 14 cu.ft. equal one ton
10 % deduction for rock
Tonnage above 1500' elevation (Track grade from Crushing Plant)

Total developed ore, January 1, 1942	4,961,676 tons
Ore mined in 1942	99,287 tons
Total developed ore, Januaryl, 1943	4,862,389 tons

Upon completion of washing operations in the East Pit area contemplated for the spring of 1943 the stripped reserves in this area will be as follows:

Above 1500' elevation	1,543,535 tons	East Pit
	228,000 tons	Summit Pit
Total	1,771,535 tons	
Possible Lower Bench	1,028,570 tons	East Pit 1440' - 1500'
Total stripped reserves	2,800,105 tons	

3. Developed Ore as of January 1st, 1943

West Pit	1,606,154 tons
East Pit, incl. Sum.	4,862,389 "
Total Tilden M.	6,468,543 tons

c. Estimated Analysis of Reserves

1. West Pit	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Ign.	Moist.
Dried	39.17	.034	41.91	.09	.90	.20	.22	.009	.24	
Natural	38.50	.033	41.20	.09	.88	.20	.22	.009	.24	1.70
2. East Pit										
Dried	37.00	.015	45.00	.09	.54	.20	.17	.009	.34	
Natural	36.50	.015	44.40	.09	.53	.20	.17	.009	.34	1.34

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4. ESTIMATE OF ORE RESERVES (CONT.)

f. Estimate of Production

The following tables show the estimated production and analysis that can be produced during the coming year. The first table shows the tonnages available by mining and loading without selective loading from the East Pit. The 7,000 tons of broken ore in the Summit Pit are omitted here, inasmuch as this ore cannot be loaded out profitably now.

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

1. ESTIMATE OF 1943 PRODUCTION AS TO PITS

Grade	Tonnage	Iron	Phos.	Sil.	Sul.	Moist.	Iron Nat'l.
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

2. ESTIMATE OF PRODUCTION BY GRADING EAST PIT ORE

Grade	Tonnage	Iron	Phos.	Sil.	Sul.	Moist.	Iron Nat'l.
Tilden Silica (includes West Pit and 50,000 tons of East Pit)	400,000	39.00	.036	42.00	.011	1.67	38.35
Tilden Low Phos. (Selected from East Pit Shipments)	50,000	37.00	.015	45.60	.009	1.36	36.50
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.

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5. LABOR AND WAGES

a. Comments

1. Labor

Labor conditions in general were quite satisfactory during the 1942 season. Eleven 3-8 hour shift and eight 2-8 hour shifs were necessary to meet Low. Phos. shipments which necessitated the use of approximately six more men than is commonly needed than when the property is working on three shovel single shift Tilden Silica operation. Adequate stocking grounds for the 1942 tonnage maintained employment at a steady level for the balance of the season.

b. Comparative Statement of Wages and Product

	1942	1941	Increase	Decrease
Product	235,207	302,943		67,736
Number of Shifts & Hours	140-1-8 hr	149-1-8 hr.		9
Avg. No. of men working	43	39	4	
Average daily wage	6.64	6.71		.07
Tons per man per day	47.01	52.31		530
Labor Ct. per ton (Labor Stmt)	.150	.132	.018	
Labor Ct. per ton (Cost Sheet)	.169	.143	.026	
Total No. of days	5,279¼	5,942¼		663
Amount paid for Labor as per Labor Statement	35,307.05	39,886.97		4,579.92
Amount paid for Labor as per Cost Sheet	39,811.86	43,934.57		4,122.71

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7. OPEN PIT OPERATIONS

a. Stripping

At the close of the shipping season stripping operations in the East Pit advancement area were started utilizing the Marion 480 shovel to remove the overburden which averaged three to fifteen feet in depth. Disposal of the overburden was made by small trucks rented for that purpose. Use of the Tilden Athey wagon with a rounded load capacity of thirteen yards proved extremely valuable in disposing of the overburden as fill for the proposed haulage road to the East Pit second bench. This latter work was done under wet muddy conditions on a steep grade made necessary, however, by the need of providing a minimun protective fill for newly laid culvert tile in anticipation of severe frost action and subsequent heavy spring run off.

Extreme winter conditions accompanied by quick freezing of dirt in roads and dumps made imperative the use of the bulldozer and tractor to maintain right of way, consequently the use of the R. D. tractor as power unit for the Athey Wagon on the road fill was temporarily discontinued.

Immediately the use of the main railroad line for shipping purposes was unnecessary a stripping project was started to remove overburden lying at the south edge of the West Pit Lower Bench. Disposal of the material was made south of the main line. The No. 52 Bucyrus Erie 120-B shovel was used in conjunction with rock dump cars mounted on flat cars as disposal units. When favorable disposal conditions developed, the rock dump cars were replaced by the two Tilden Euclid trucks.

Washing will be done on both stripped areas as soon as weather conditions permit. The natural slope of the East Pit stripped area towards the face necessitates the erection of control windrows by the bulldozer to prevent contamination of the broken ore. To maintain the amount of material to be washed to a minimun it is necessary in this rough creviced area to employ the bulldozer to the fullest extent prior to washing. In the south area of the West Pit Lower Bench the material washed will be cast by the shovel onto a berm adjacent to the main railroad line to form a protective buffer for the initial blast in that area.

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7. OPEN PIT OPERATIONS (CONT.)

a. Stripping (Cont.) E. & A. CC-60 - Tilden Mine Stripping

For stripping and Washing 23,000 yards of Overburden at the Tilden East Pit to make available 700,000 tons of ore.

DETAIL	AMOUNT E. & A.	AMOUNT EXPENDED 1941	AMOUNT EXPENDED 1942	EXPENDED TO DATE	UNEXPENDED
20,000 yards of Stripping at 15¢ per yard	$3,000.00	266.74	1,105.98	1,372.72	1,627.28
3,000 yards of Washing at 73¢ per yard	2,190.00	921.76		921.76	1,268.24
10 percent on above for Contingencies .....(1)	519.00	171.15		171.15	347.85
Test Pits - East Pit Advancement area ...(2)		191.52		191.52	191.52
Exploratory Drilling East Pit advancement area(2)		663.27	1,543.48	2,206.75	2,206.75
Social Security Taxes (2)		21.68		21.68	21.68
Total	5,709	2,236.12	2,649.46	4,885.58	823.42

(1) Under the exacting conditions of clean bulldozer work necessary in this area, the equipment was put to a much more severe use than is usually the case which necessitated several repairs to the equipment.

(2) Note: Not included in original estimate.

E. & A. CC 113 - Tilden Mine Stripping West Pit

To make available 170,000 tons of ore for mining, and also make a better mining operation and reduce the cost per ton slightly on the ore taken from the lower bench.

DETAIL	AMOUNT E. & A.	EXPENDED 1942	UNEXPENDED
Moving Pole Line .....$	370.00	300.00	70.00
40 feet Culvert @ 3.65	146.00	145.27	.73
Planking R.R.Tracks for Trucks	80.00	71.09	8.91
Locomotive rental & Track Wk.	212.00	82.82	129.18
*30,000 yards of stripping ... at 10¢ per yard	3000.00	2538.29	461.71
6,000 yards Washing & Cleanig at 50¢ per yard	3000.00		3000.00
10 percent for Contingencies	680.80		680.80
Total	7488.80	3,137.47	4351.33

*This Item completed on January 13th, 1943. Yardage 31,840.

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7. OPEN PIT
OPERATIONS (CONT.)

a. Stripping (Cont.) E. & A. CC 102 - Tilden Mine Stripping East Pit

For stripping 11,000 cubic yards, and 2,000 cubic yards overburden at the Tilden East Pit to make available 137,000 tons and to facilitate mining operations in the East Pit where the height of the bank is being cut into two benches.

DETAIL	AMOUNT E. & A.	EXPENDED 1942	UNEXPENDED
11,000 cu. yds. stripping at 30¢ per yard ....(1)	$3,300.00	4,651.83	1,351.83
2,000 cu. yds Washing at 73¢ per yd	1,460.00		1,460.00
5,400 cu. yds of filling for 2nd bench road	540.00		540.00
Temporary surfacing road	250.00		250.00
50 ft. Culvert	100.00	285.00	185.00
Changing transformers etc.	200.00	154.92	45.08
10 percent for contingencies	585.00		585.00
Total	6,435.00	5,091.75	1,343.25

(1) This stripping was completed in January 1943. The Yardage total 20,585 yards. The Washing will be done early in the spring.

f. Drilling Blasting & Explosives

A slightly less footage was drilled in 1942 at the property by the two Bucyrus-Armstrong 29-T drill rigs, but a higher footage was obtained per shift and also better Bit performance than the previous year.

In 1942 a total of 8,889 feet was drilled with no footage lost as compared with a footage of 9,145 in 1941 with 64 feet lost. All blasting faces were drilled in 1942 which factor gives strong support to the statement that the net footage per shift and bit performance efficiencies were substantially higher.

Drilling costs were the lowest in 1942 than in all previous years at the property using nine inch rigs, which were lower cost machines than the former six inch rigs.

A statement of Drilling statistics for the year follows.

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7. OPEN PIT OPERATIONS (CONT.)

f. Drilling, Blasting & Explosives

1. Drilling

	1942			1941		
	Shifts Worked	Footage Drilled	Footage per 8 hr. shift	Shifts Worked	Footage Drilled	Footage per 8 hr. Shift
Lower Bench W. Pit	151	3305	21.88	86	1755	20.41
West End West Pit	15	240	16.00	205	2957	14.42
East Pit	242	5344	22.08	117	2456	20.99
E. End of W. Pit				93	1977	21.55
Totals	408	8889	21.78	501	9145	18.25

The increase in footage obtained per shift 1942 over 1941 is 3.53 feet or 19%.

	1942			1941		
	Bits Used	Footage Obtained	Footage Per Bit	Bits Used	Footage Obtained	Footage Per Bit
Lower Bench W. Pit	357	3305	9.26	256	1755	6.85
E.End of West Pit				307	1977	6.44
W. End of West Pit	37	240	6.49	723	2957	4.09
East Pit	669	5344	7.98	410	2456	5.99
Totals	1063	8889	8.36	1696	9145	5.39

The increase in footage obtained per bit in 1942 over 1941 is 2.97 feet.

Statement of Drilling Costs for Year

	East Pit	Lower Bench	West Bench	Total
Labor	5,890.84	3,590.88	297.34	9,779.06
Supplies	3,251.87	1,552.57	53.52	4,856.96
Total	9,142.71	5,143.45	350.86	14,636.02
Net Footage	5,344	3,305	240	8,889
Total Cost less Depr. on Churn Drill Equipment	1.71	1.55	1.46	1.64
Depreciation				.18
1942 Total Cost				1.82

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7. OPEN PIT
OPERATIONS (CONT.)

f. Drilling, Blasting & Explosives (Cont.)

1. Drilling (Cont.)

Cost of Operating 9" Churn Drills in East Pit - 1942

Total Footage of Holes Drilled	5,344'
Total Footage of Holes Lost	0
Net Available Footage	5,344'

Operating	Labor	Suuplies	Total	Cost Per Foot
Drilling at Mine	$ 3m377.90	107.72	3,485.62	.653
Sharpening Bits	1,599.73	573.88	2,173.61	.406
Pipe & Fittings		100.76	100.76	.019
New Bits		961.18	961.18	.180
New Tools		96.88	96.88	.018
New Rope		144.46	144.46	.028
Electric Power		458.55	458.55	.085
Truck & Tractor	850.84	257.84	1,108.68	.208
Total Operating	5,828.47	2,701.27	8,529.74	1,597
Maintenance				
Drill Maintenance	52.37	252.39	304.76	.057
Bit Dresser Maintenance	10.00	298.21	308.21	.057
Total Maintenance	62.37	550.60	612.97	.114
Total Maintenance and Operating	5,890.84	3,251.87	9,142.71	1,710
Depreciation on Churn Drill Equipment		983.29	983.29	.184
Total Maintenance, Operating and Depreciation	5,890.84	4,235.16	10,126.00	1,894

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7. OPEN PIT OPERATIONS (CONT.)

f. Drilling, Blasting and Explosives (Cont.)

1. Drilling (Cont.)

Cost of Operating 9" Churn drills in West End of West Pit - 1942

Total Footage of Holes Drilled	240
Total Footage of Holes Lost	0
Net Available Footage	240

Operating	Labor	Supplies	Total	Cost Per Foot
Drilling at Mine	$ 200.40	$ 5.60	$ 206.00	$ .858
Sharpening Bits	63.20	12.03	75.23	.313
Pipe & Fittings		9.67	9.67	.040
Electric Power		15.00	15.00	.062
Truck & Tractor	33.74	11.22	44.96	.187
Total Operating...	297.34	53.52	350.86	1.460
Maintenance				
Drill Maintenance	- -	- -	- -	
Bit Dresser	- -	- -	- -	
Total Maintenance and Operating ...	297.34	53.52	350.86	1.460
Depreciation on Churn drill Equipment		44.16	44.16	.184
Total Maintenance, Operating and Depreciation	$ 297.34	$ 97.68	$ 395.02	$ 1.644

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7. OPEN PIT OPERATIONS (CONT.)

F. Drilling, Blasting & Explosives (Cont.)

2. Blasting

Primary blasting costs per ton of ore broken was slightly less this year than in 1941. The policy of reducing the amounts of higher cost gelatin dynamites and substituting column loading of lower priced semi-gel was continued with gratifying loading performances by the shovels as mentioned previously.

A blast producing 19,900 tons of ore was fired in the Lower Bench West Pit August 13, 1942 using Nitraman explosive manufactured by the E. I. DuPont Co. A reduction of approximately six percent in the cost of primary explosives was shown by the use of this ammonium nitrate powder, substantiating the trend in Tilden blasting policy towards this type of explosive. Shovel performance in this blasted area was average and no unsatisfactory toe conditions were encountered.

Six primary blasts were fired during the season two in the East Pit and the remainder in the West Pit, a double blast in the East Pit was made to cut out the Second Bench, followed later in the season by another single blast in the upper bench to establish a berm.

The following table outlines data pertinent to the blasts:

Location	Blast No.	Date	No. of Holes	Footage	Pounds Powder	Estimated Tonnage	Tons of Ore per Pound of Powder
Lower Bench W. Pit	8	5-6	10	663	11,450	26,000	2.27
East Pit	20	6-5	65	4,353	76,450	186,000	2.45
E. half of W. Pit	1-42	7-14	11	741	14,500	41,700	2.87
Lower Bench W. Pit	9	8-13	7	476	8,706	19,900	2.30
W. half of West Pit	1-42	9-9	25	2,214	40,750	103,000	2.53
E. Pit Second bench	2	10-9	31	1,509	23,000	63,000	2.74
Total			149	9,956	174,856	439,600	2.51

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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, 1941

Primary Blasting

KIND	Quantity	Price	Amount
Gelamite #2 7½" X 24"	90,600 lbs	$ 11.50	$ 10,419.00
75% Gelatin.....	75,550 lbs	12.75	9,632.63
Nitramen A.	5,947 lbs	11.00	654.17
Nitramen C.	2,479 lbs	11.00	272.69
Nitramen Primers	280 lbs	5.00 each	35.00
Total Powder	174,856	12.01	21,013.49
Blasting Supplies			
Primacord Bickford Fuse, Wire Bound	7,000	44.19	309.36
Primacord Bickford Fuse, regular	4,500	35.73	161.25
Primacord Bickford Fuse, Reinf'd	6,000	36.50	219.00
Total Blasting Supplies	17,500		689.61
Total All Explosives			21,703.10
Total Ore Blasted in 1942		439,600	
Tons of Ore per lb. of Powder ..		2.51	
Cost per ton for Powder		.0478	
Cost per ton for Fuse, Caps, etc.		.0015	
Cost per ton for all Explosives.		.0493	
Average price per lb. for powder		.1201	

Secondary Blasting

KIND	Quantity	Price	Amount
60% Gelatin	5,850 lbs.	11.50	672.75
Gelamite #1			
Total Powder	5,850 lbs.	11.50	672.75
Blasting Supplies			
Connecting Wire	17#	.40	6.80
Clover Fuse	18,000 '	5.15 M	92,70
#6 Blasting Caps	4,080	12.05 M	48.20
#7 Hot Wire Lighters	400	6.75 M	2.70
Total Blasting Supplies ..			150.40
Total All Explosives			823.15

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7. OPEN PIT
OPERATIONS (CONT.)

f. Drilling, Blasting & Explosives (Cont.)

2. Blasting (Cont.) (Secondary)

Product	235,207
Pounds of Powder per ton of Ore	.024
Cost per ton for Powder	.0029
Cost per ton for Fuse, Caps, etc.	.0006
Cost per ton for All Explosives	.0035
Average Price per lb. for Powder	.1150

COMBINED TOTAL BLASTING COSTS

Kind	Quantity	Price	Amount
Gelamite #2 7½" X 24"	90,600 lb.	11.50	10,419.00
75% Gelatin	75,550 lb.	12.75	9,632.63
Nitramen A	5,947 lb.	11.00	654.17
Nitramen C	2,479 lb.	11.00	272.69
Nitramen Primers	280 lb.	5.00	35.00
60% Gelatin	5,580 lb.	11.50	672.75
Total Powder	180,706 lb.		21,686.24
Blasting Supplies			
Connecting Wire	17 lb.	.40	6.80
Primacord Bickford (Wire Bound)	7,000 '	44.19	309.36
Primacord Bickford (Regular)	4,500 '	35.73	161.25
Primacord Bickford (Reinforded)	6,000 '	36.50	219.00
Clover Fuse	18,000 '	5.15	92.70
# 6 Blasting Caps	4,000	12.05	48.20
# 7 Hot Wire Lighters	400	6.75	2.70
Total Blasting Supplies			840.01
TOTAL ALL EXPLOSIVES			22,526.25

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7. OPEN PIT OPERATIONS (CONT.)

f. Drilling, Blasting and Explosives (Cont.)

3. Statement of Cost of Drilling and Blasting 186,000 Tons of Ore in the East Pit

Net feet of 9" Holes Drilled - 4,353'

Drilling Cost Operating	Labor	Supplies	Total	Cost Per Foot	Cost Per Ton
Drilling at Mine	$ 2,829.45	95.97	2,925.42	.672	
Sharpening Bits	1,300.24	467.08	1,767.32	.406	
Pipe & Fittings		82.70	82.70	.019	
New Bits		783.54	783.54	.180	
New Tools		78.35	78.35	.018	
Electric Power		370.00	370.00	.085	
New Rope		121.88	121.88	.028	
Truck & Tractor	692.13	213.10	905.23	.208	
Total Operating	4,821.82	2,212.62	7,034.44	1.616	
MAINTENANCE					
Drill Maintenance	43.53	204.59	248.12	.057	
Bit Dresser	82.70	165.42	248.12	.057	
Total Maintenance	126.23	270.01	496.24	.114	
Total Maintenance and Operating	4,948.05	2,582.63	7,530.68	1.730	
Depreciation on Churn Drill Equipment		800.95	800.95	.184	
Total Maintenance, Optg. and Depreciation	4,948.05	3,383.58	8,331.63	1.914	
Primary Blasting Costs					
Labor Loading Holes	105.69		105.69		
Explosives		9,474.75	9,474.75		
Other Supplies		23.55	23.55		
Total Blasting Costs	105.69	9,498.30	9,603.99		
Grand Total, Operating, Maintenance, and Primary Blasting Costs	5,053.74	12,881.88	17,935.62		.0964

TILDEN MINE
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7. OPEN PIT
OPERATIONS (CONT.)

f. Drilling, Blasting and Explosives (Cont.)

3. Statement of Cost of Drilling and Blasting 63,000 Tons of Ore in the Second Bench, East Pit

Net feet of 9" Holes Drilled - 1,509'

Drilling Cost Operating	Labor	Supplies	Total	Cost Per Foot	Cost Per Ton
Drilling at Mine	$ 950.67	32.71	983.38	.653	
Sharpening bits	437.61	175.04	612.65	.406	
New bits	271.62	271.62	271.62	.180	
New Tools		27.16	27.16	.018	
Electric Power		128.26	128.26	.085	
New Rope		42.25	42.25	.028	
Pipe & Fittings		28.67	28.67	.019	
Truck & Tractor	226.35	89.52	315.87	.208	
Total Operations	1,614.63	795.23	2,409.86	1.597	
Maintenance					
Drill Maintenance	16.00	70.01	86.01	.057	
Bit Dresser	10.00	76.01	86.01	.057	
Total Maintenance	26.00	146.02	172.02	.114	
Total Miantenance and Operating	1,640.63	941.25	2,581.88	1.710	
Depreciation on Churn drill Equipemnt		277.65	277.65	.184	
Total Maintenance, Optg. and Depreciation	1,640.63	1,218.90	2,859.53	1.894	
Primary Blasting Costs					
Labor Loading Holes	66.36		66.36		
Explosives		2,891.75	2,891.75		
Other Supplies		8.10	8.10		
Total Blasting Costs	66.36	2,899.85	2,966.21		
Grand Total, Operating, Maintenance and Primary Blasting Costs	1,706.99	4,018.75	5,825.74		.0927

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7. OPEN PIT
OPERATIONS (CONT.)

f. Drilling, Blasting and Explosives (Cont.)

3. Statement of Cost of Drilling and Blasting 41,700 Tons of Ore in the East Half of the West Pit

Net feet of 9" Holes Drilled - 741'

Drilling Cost Operating	Labor	supplies	Total	Cost Per Foot	Cost Per Ton
Drilling at Mine	$ 543.89	28.16	572.05	.772	
Sharpening bits	153.39	123.74	277.13	.374	
New Rope		45.20	45.20	.061	
Electric Power		64.47	64.47	.087	
New bits		187.47	187.47	.253	
New Tools		157.83	157.83	.213	
Truck and Tractor	155.61	24.45	180.06	.243	
Total Operating	852.89	631.32	1,484.21	2.003	
Maintenance					
Drill Maintenace	9.63	77.07	86.70	.117	
Bit Dresser		14.82	14.82	.020	
Total Maintenance	9.63	91.89	101.52	.137	
Total Maintenance and Operating	862.52	723.21	1,585.73	2.140	
Depreciation on Churn Drill Equipment		134.12	134.12	.181	
Total Maintenance, Optg. and Depreciation	862.52	857.33	1,719.85	2.321	
Primary Blasting Costs					
Labor Loading Holes	72.51		72.51		
Explosives		1,803.86	1,803.86		
Other supplies		3.74	3.74		
Total Blasting Costs	72.51	1,807.60	1,880.11		
Grand Total, Operating, Maintenance, and Primary Blasting Costs	935.03	2,664.93	3,599.96		.084

TILDEN MINE
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7. OPEN PIT
OPERATIONS (CONT.)

f. Drilling, Blasting and Explosives (Cont.)

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

Net Feet of 9" Holes Drilled - 2,214 '

Drilling Cost Operating	Labor	Supplies	Total	Cost Per Foot	Cost Per Ton
Drilling at Mine	$ 2,450.89	90.78	2,541.67	1.148	
Sharpening bits	912.17	571.21	1,483.38	.670	
Electric Power		247.97	247.97	.112	
New bits		520.29	520.29	.235	
New Tools		329.88	329.88	.149	
Pipe & Fittings		79.67	79.67	.036	
Truck & Tractor	575.64	135.05	710.69	.321	
Total Operating	3,938.70	1,974.85	5,913.55	2.671	
Maintenance					
Drill Maintenance	81.25	82.39	163.64	.074	
Bit Dresser Maintenance		55.35	55.35	.025	
Total Maintenance	81.25	137.74	218.99	.099	
Total Maintenance and Operating	4,019.95	2,112.59	6,132.54		
Depreciation on Churn drill Equipment		400.99	400.99	.181	
Total Maintenance, Optg. and Depreciation	4,019.95	2,513.58	6,533.53	2.951	
Primary Blasting Costs					
Labor Loading Costs	90.00		90.00		
Explosives		5,053.88	5,053.88		
Other Supplies		8.10	8.10		
Total Blasting Supplies	90.00	5,061.98	5,151.98		
Grand Total, Operating, Maintenance, and Primary Blasting Costs	4,109.95	7,575.50	11,685.51		.113

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7. OPEN PIT OPERATIONS (CONT.)

f. Drilling, Blasting and Explosives (Cont.)

3. Statement of Cost of Drilling and Blasting 19,900 Tons of Ore in the Lower Bench, West Pit
Net feet of 9" Holes Drilled - 476'

Drilling Costs Operating	Labor	Supplies	Total	Cost Per Foot	Cost Per Ton
Drilling at Mine	$ 309.40	71.40	380.80	.779	
Sharpening bits	145.66	45.42	191.08	.401	
New bits		22.37	22.37	.047	
New Tools		31.42	31.42	.066	
Electric Power		25.51	25.51	.054	
New Rope		6.19	6.19	.013	
Pipe & Fittings	35.00	30.68	65.68	.138	
Truck & Tractor	27.60	18.09	45.69	.117	
Total Operating	517.66	251.08	768.74	1.615	
Maintenance					
Bit Dresser	4.00	1.24	5.24	.011	
Drill Maintenance	7.29	6.03	13.32	.028	
Total Maintenance	11.29	7.27	18.56	.039	
Total Maintenance and Operating	528.95	258.35	787.30	1.654	
Depreciation on Churn drill Equipment		87.58	87.58	.184	
Total Maintenance, Optg. and Depreciation	528.95	345.93	874.88	1.838	
Primary Blasting Costs					
Labor Loading Holes	60.00		60.00		
Explosives		1,024.11	1,024.11		
Other Supplies		4.02	4.02		
Total Blasting Supplies	60.00	1,028.13	1,088.13		
Grand Total, Operating, Maintenance, and Primary Blasting Costs	588.95	1,374.06	1,963.01		.098

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7. OPEN PIT
OPERATIONS (CONT.)

f. Drilling, Blasting & Explosives (Cont.)

3. Statement of Cost of Drilling and Blasting 26,000 Tons of Ore in Lower Bench, West Pit

Net feet of 9" Holes Drilled - 663'

Drilling Cost Operating	Labor	Supplies	Total	Cost Per Foot	Cost Per Ton
Drilling at Mine	$ 449.51	16.91	466.42	.704	
Sharpening Bits	184.09	97.02	281.11	.424	
New Rope		19.43	19.43	.029	
New Bits		88.28	88.28	.133	
Electric Power		27.88	27.88	.042	
New tools		24.53	24.53	.037	
Building Roads	12.60		12.60	.019	
Trucks and Tractor	134.72	35.00	169.72	.256	
Total Operating	780.92	309.05	1,089.97	1.644	
Maintenance					
Drill Maintenance	17.23		17.23	.026	
Drill Sharpener Equip.	13.26		13.26	.020	
Total Maintenance	30.49		30.49	.046	
Total Maintenance and Operating	811.41	309.05	1,120.46	1.690	
Depreciation on Churn Drill Equipment		120.00	120.00	.181	
Total Maintenance Optg. and Depreciation	811.41	429.05	1,240.46	1.871	
Primary Blasting Costs					
Labor Loading Holes	35.00		35.00		
Explosives		1,454.75	1,454.75		
Other Supplies		57.99	57.99		
Total Blasting Costs	35.00	1,512.74	1,547.74		
Grand Total, Operating, Maintenance, and Primary Blasting Costs	846.41	1,941.79	2,788.20		.107

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7. OPEN PIT
OPERATIONS (CONT.)

g. Loading Operations

Loading from the stockpiles started on March 28th and from the pits on May 19th. The pits were shut down October 30th and the last shipment made from the stockpiles on November 23rd.

In the Lower Bench West Pit the light No. 46 Marion 480 shovel was replaced by the new No. 52 Bucyrus-Erie 120-B on July 27th. The two new Euclid fifteen ton trucks serviced the Lower Bench the entire season in an entirely satisfactory manner.

The second bench of the East Pit was opened this year but the broken ore from this elevation will be loaded from the main bench for several seasons.

The remaining ore in the West half of the West Pit was blasted during the summer. Following the clean up of the ore in this area which can be expected during 1943 no further activety in that area is possible.

The 1942 season schedule of shovel movements is noted below:

No. 29 Shovel	Loaded in Stockpile March 28th - May 11th Loaded in Upper Bench W. Pit May 12th - Close of season
No. 31 Shovel	Loaded in East Pit entire season
No. 46 Shovel	Loaded waste rock from Upper Bench W. Pit from April 15th -April 22nd Loaded ore from Lower Bench W. Pit May 19th - July 27th Stripped overburden East Pit from Oct 31st - Dec 31st
No. 52 Shovel	Loaded ore from Lower Bench W. Pit July 27th - Close of season Stripped south side of L. B. W. Pit Nov 3rd - Nov 9th Loaded from stockpile Nov 9th - Nov. 18th Stripped south side of L. B. W. Pit Nov 19th - Nov 23rd Loaded from stockpile Nov. 23rd Stripped south side L. B. W. Pit Nov. 24th - Dec. 31st

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8. COST OF OPERATING

a. Comparative Mining Costs

	1942	1941	Increase	Decrease
Production	235,207	302,943		67,736
Average Daily Output	1,680	2,033		353
Tons per man per day	47.01	52.31		5.3
Numbers of days operating	140	149		9
Number of shifts and hours	91-1-8 hr. 11-3-8 hr. 8-2-8 hr.	141-1-8 hr. 4-2-8 hr.		
Cost				
Stocking and Loading Ore .	.019	.011	.008	
Pit Operating Accounts ...	.358	.333	.025	
Pit General Accounts	.053	.042	.011	
Cost at Mine	.430	.386	.044	
Idle and Winter Expense ..	.144	.124	.020	
Total Cost at Mine ..	.574	.510	.064	
Depreciation				
Plant and Equipment	.084	.059	.025	
Taxes	.030	.025	.005	
Stripping	.016	.015	.001	
Grand Total Cost at Mine .	.704	.609	.095	
Expense Beyond Mine				
Freight - Rail	.650	.650		
Lake Freight	.860	.860		
Cargo Insurance and Analysis	.011	.011		
Shrinkage	.013	.012	.001	
TOTAL COST LOWER LAKES .	2.238	2.142	.096	

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8. COST OF OPERATING (CONT.)

b. Detailed Cost Comparason

4. Open Pit Costs

	1942	1941	Increase	Decrease
Shifts and Hours	91-1-8 Hr. 11-3-8 hr. 8-2-8 hr.	141-1-8 hr. 4-2-8 hr.		9
Production tons	235,207	302,943		67,736
Average Product per 8 hr. Shift	1,680	2,033		355
Number of Shifts Worked	140	149		9

PIT OPERATIONS	1942		1941		Increase		Decrease	
	Amount	Per Ton	Amount	Per Ton	Amount	Per Ton	Amount	Per Ton
Direct Ore								
1. Drilling and Blasting	$31,007.22	.133	39,791.19	.130		.003	8,783.97	
2. Power Shovels Operating	8,462.47	.036	10,845.49	.036		.000	2,383.02	
3, Power Shovels Maintenance	4,532.42	.019	4,289.25	.014	243.17	.005		
4. Locomotives & Cars Operating	7,860.80	.033	10,163.85	.034			2,303.05	.001
5. Locomotives & Cars Maintenance	437.90	.002	890.10	.003			452.20	.001
6. Track Expense	2,879.57	.012	3,239.77	.011		.001	360.20	
6A. D-8 Tractor Operating	913.63	.004	4,584.15	.015			3,670.52	.011
6B. D-8 Tractor Maintenance	728.19	.003	764.20	.003			36.01	.000
7. Euclide Trucks Operating	1,165.01	.005	- -	-	1,165.01	.005		
7A. Euclide Trucks Maintenance	60.38	.000			60.38	.000		
TOTAL DIRECT ORE ..	$58,047.59	.247	74,568.00	.246		.001	16,520.41	
General Pit Expense								
8. Water Supply	54.65	.000	150.27	.000			95.62	.000
9. Buildings	1,887.51	.008	344.57	.001	1,542.94	.007		
10. Crushing and Screening	15,669.70	.066	17,473.33	.058		.008	1,803.63	
11. General Open Pit Expense	6,751.94	.029	6,567.57	.022	184.37	.007		
13.Open Pit Supts	1,683.60	.007	1,438.80	.005	244.80	.002		
14. Waste Pile Expense.	127.03	.001	293.18	.001			166.15	.000
14A.Testpitting			94.16	.000				
15 Exploration								
Drilling								
TOTAL GENERAL EXPENSE ..	26,174.43	.111	26,361.88	.087		.024	187.45	
TOTAL PIT OPERATION	84,222.02	.358	100,929.88	.333		.025	16,707.86	
Stocking Crushed Ore	3,093.89	.013	2,801.26	.009	292.63	.004		
GRAND TOTAL	87,315.91	.371	103,731.14	.342		.029	16,415.23	

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8. Cost of Operating (Cont.)

b. Detailed Cost Comparison (Cont.)

4. Open Pit Costs (Cont.)

	1942		1941		Increase		Decrease	
GENERAL MINE EXPENSE	Amount	Per Ton	Amount	Per Ton	Amount	Per Ton	Amount	Per Ton
16. Mining Engineering	901.15	.004	749.45	.002	151.70	.002		
16A. Geological	22.91	.000	19.05	.000	3.86	.000		
17. Mechanical & Elec. Engr.	144.05	.001	210.43	.001			66.38	.000
18. Analyisis & Grading	4,056.62	.016	3,558.26	.013	498.36	.003		
19. Safety Department	107.28	.001	99.00	.000	8.28	.001		
20. Local & General	234.00	.001	272.00	.001			38.00	.000
21. Special Expense	374.36	.002	434.68	.001		.001	60.32	
22. Ishpeming Office	860.00	.004	922.00	.003		.001	62.00	
23. Mine Office	2,043.51	.008	2,209.19	.008			165.68	
24. Insurance	188.31	.001	161.46	.001	26.85	.000		
25. Personal Injury	370.66	.002	398.64	.001		.001	27.98	
26. Social Security Taxes ..	1,114.27	.005	1,928.30	.006			814.03	.001
27. Employees Vacation Pay .	1,941.17	.008	1,595.64	.005	345.53	.003		
Total Gen. Mine Expense	12,358.29	.053	12,558.10			.011	199.81	
IDLE & WINTER EXPENSE ..	33,777.82	.144	37,612.40	.124		.020	3,834.58	
COST OF PRODUCTION	133,452.02	.568	153,901.64	.508		.060	20,449.62	
28. Depr. Plant & Equipment	17,129.11	.073	16,859.98	.056	269.13	.017		
28A. Depr. Motorized Equip. .	5,409.76	.023			5,409.76	.023		
29. Amortization Stripping .	4,704.14	.020	4,834.47	.016		.004	130.33	
30. Taxes	7,139.38	.030	7,779.73	.025		.005	640.35	
Amortization Development	768.28	.003	934.09	.003			165.81	
Depletion of Orig. Cost.	659.88	.003	796.07	.003			136.19	
COST AT MINE	35,810.55	.152	31,204.34	.103	4,606.21	.049		
Loading Stocked Ore	1,494.19	.006	708.61	.002	785.58	.004		
Inventory Adjustment ...	17.71	.000	10.46	.000	7.25			
TOTAL COST AT MINE	170,773.47	.726	185,825.05	.613		.113	15,051.58	

9. Buildings

It was necessary to build and insulate one stall 30 inch by 24 inch, and also build a repair Pit at a Cost of $1,827.31. This expenditure, and the decreased product accounts for the increased cost per ton.

10. Crushing and Screening

In the month of August the employees of the Tilden Mine not entitled to a vacation, installed one Lower mantle in east ten inch crusher and one upper and one lower mantle, and four new Diaphram Liners in west ten inch Crusher, sixteen new Grizzley bars over fine Dirt chute, and installed eight new Diaphram Liners in the 42 inch Crusher, the cost of this work and the decreased product accounts for the increased cost per ton.

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8. COST OF OPERATING (CONT.)

b. Detailed Cost Comparison (Cont.)

4. Open Pit Costs (Cont.)

11. General Open Pit Expense

The Watchman's time is charged to this account. The charge is practically static the decreased product accounts for the increased cost.

13. Open Pit Supplies

Decreased tonnage accounts for increased Cost.

Idle and Winter Expense

The increased .020 cost per ton is due to the decreased product.

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

	Labor	Supplies	Total
January	2,910.57	3,063.53	5,974.10
February	3,117.90	3,183.39	6,301.29
March	3,253.12	5,465.68	8,718.80
April	3,128.86	2,512.79	6,741.65
June		240.00 *	240.00 *
November	1,977.93	1,438.70	3,416.63
December	2,332.15	1,633.20	3,965.36

* Tax adjusted to Operating Cost sheet.

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10. TAXES

Tilden Township Tilden Mine	1942 Valuation	 Taxes	1941 Valuation	 Taxes
N½ of Sec 26, 47-27	270,000.	5,228.90	310,000.	6,045.16
Personal Supplies & Equipment	95,000.	1,839.80	85,000.	1,657.54
Total	365.000.	7,068.70	395,000.	7,702.70
Collection fees		70.68		77.03
Total Tilden Mine	365,000.	7,139.38	395,000.	7,779.73

11. PERSONAL INJURY

There were two lost time accidents at the Tilden Mine during the year 1942.

12. NEW CONSTRUCTION
AND PROPOSED
NEW CONSTRUCTION

On March 7th, 1941 the building housing the drill sharpening equipment was entirely destroyed by fire. A new building purchased from the Truscon Steel Co. was erected by Company men and equipment on the same site. In the spring of 1942 the building, both interior and exterior, was painted, the cost of which is given in the E. & A. below.

E. & A. CC-75:

	Amount Authorized	Amount Expended
Quotation of Truscon Co.	2,195.00	2,214.93
Erection by Company men	200.00	383.48
Concrete Foundations	200.00	314.37
Glass, Painting, etc.	205.00	274.11
Social Security Taxes		15.97
Total	2,800.00	3,202.86

To provide suitable access to the Lower Bench of the West Pit for the motorized haulage equipment, a hard surface haulage road from the ore face to a terminal area at the crusher was constructed under E. & A. CC-97. This permanent haulage route from the Lower Bench has increased the efficient speed of the two Euclid trucks and reduced tire wear to a minimum. The Cost of this work is given below.

E. & A. CC-97:

Quotation from City of Ishpeming	Amount Authorized	Amount Expended
Road in Pit 15 feet by 600 feet.	500.00	496.08
Terminal Area at Crusher	400.00	400.00
Sub Base to be put in by Company	100.00	124.79
10 percent for contingencies ...	100.00	
Total	1,100.00	1,020.87

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13. EQUIPMENT AND PROPOSED NEW EQUIPMENT

a. Shovels

In July the erection of the No. 52 Bucyrus-Erie 120-B shovel was completed and was put into operation in the ore area of the Lower Bench West Pit to replace the No. 46 Marion 480 shovel.

E. & A. CC-83 - Bucyrus-Erie Model No. 120-B Mining Shovel

	Amount Authorized	Amount Expended
1 Bucyrus-Erie Model 120-B	78,425.00	78,425.00
Estimated Freight on Shovel	1,000.00	978.14
1000 feet Cable delivered	1,140.57	1,275.06
Setting up Shovel	1,000.00	1,066.40
Total	81,565.57	81,744.60

c. Haulage Equipment

Two Euclid fifteen ton trucks were purchased to adequately service the No. 52 shovel in the Lower Bench area. The cost of the haulage units is given in the following E. & A.

E. & A. CC-88 - Euclid Trucks

	Amount Authorized	Amount Expended
2-15 ton Euclid Trucks	22,780.00	22,780.00
Spare tires etc.	659.16	540.69
Freight to Ishpeming	400.00	483.94
Total	23,839.16	23,895.63

Tonnage hauled from the Lower Bench by the trucks totalled 55,116 tons. The costs entailed in this haulage are given below:

	Labor	Supplies	Total	Tons
May	90.94	16.88	107.82	4,480
June	173.46	12.02	185.48	9,274
July	165.75	41.24	206.99	11,011
August	194.02	19.20	213.22	10,341
September	197.20	76.58	273.78	12,499
October	150.57	27.15	177.72	7,511
Total	971.94	193.07	1,165.01	55,116

The cost per ton for this operation amounted to $.021 without depreciation charges.