LLOYD MINE
ANNUAL REPORT
YEAR 1936

14. MAINTENANCE AND REPAIRS (Cont)

b. Location (Cont)

1. General Maintenance (Cont)

Costs have been rising steadily for the past four years, but the largest increase in 1936 was occasioned by repairs to the concrete reservoir. For some time past the wall of this large tank has been slabbing and several leaks finally started. These were not important as the tank usually overflowed once in 24 hours, but it was decided to reinforce the wall to prevent further decomposition. This expense amounted to $1,055.15 and this nearly equaled the pumping charge for the year.

2. Rented Buildings

During the past several years little or no extraordinary repairing was done on the North Lake houses. Some of the work was done in 1936 to reduce the greater expense which would have otherwise resulted. The work was started in June and during the next two months 16 of the houses were painted. Weathered window sashes in the other buildings were painted to stop decay, roofs and chimneys were repaired, and sheetrock placed on spoiled or badly cracked plaster interior walls. This work was continued until November, and the total cost and comparison with 1935 is shown as follows:

	Labor	Supplies	Total
1936	5,614.54	4,345.20	9,959.74
1935	2,156.86	2,771.55	4,928.41
Increase - 1936			5,031.33

Next year it will be necessary to do considerable more outside painting as the remainder of the houses are in very poor shape since the siding has been exposed to the weather for so many years. It will also probably be necessary to replace many of the posts and sills under the houses and continue the chimney foundations to the ground because their weight is depressing the floors. The inside repairs were extensive in 1936 and with few exceptions all that will be necessary is paint and calsomine in the Spring.

15. POWER

The total consumption of electric power in 1936 increased roughly in proportion to the larger production. The comparative figures for the last two years follow:

	K. W. H.	Cost
1936	2,120,592	30,507.89
1935	1,539,534	23,470.36
Increase	581,058	7,037.53
Percentage Increase	38%	30%

The increased consumption reduced the unit cost from 1.52¢ per K.W.H. in 1935 to 1.44¢ in 1936.

LLOYD MINE
ANNUAL REPORT
YEAR 1936

16. WATER SUPPLY

The water supply for the Lloyd Mine and the North Lake Location consists of a pump on the 2nd level near the Lloyd shaft piped to a concrete reservoir 50' in diameter and 20' high on the hill West of the Section 6 Shaft. As noted under the heading of Maintenance and Repairs, the decomposition of the concrete wall of the reservoir necessitated reinforcement in 1936. In October forms were placed around the tank to a height of 10 ft. and an additional concrete wall erected. This wall averaged 7" in thickness, and was reinforced with old hoisting rope.

17. CONDITION OF PREMISES

The new garage and office buildings contributed much to the improvement of the appearance of the mine property. These buildings together with the newly enclosed headframe have completely changed the mine surface picture. No landscaping or improvement of grounds which will be in keeping with the structures has yet been attempted and a start on this work will be made in 1937.

The usual clean appearance of the location premises was maintained in 1936 with the additional benefit of the 16 freshly painted houses. The Ishpeming District Superintendent's home overlooking the main street of the location is one of the show places of the county with its beautiful flowers and grounds in the summer, and it provides a model which many of the inhabitants have followed.

18. NATIONALITY OF EMPLOYEES

	1936	1933
Finnish	90	27
Italians	40	7
French	39	18
Scandinavians	29	10
English	23	6
German	2	0
Austrian	1	1
Irish	1	0
Total	225	69

The 1933 comparison is listed to show the percentage increase of each nationality during the past few years. The largest was Italian and this group was closely followed by those of English nationality or extraction.

MORRIS MINE

ANNUAL REPORT

YEAR 1936

1. GENERAL:

Production in the early months of the year was held at about 25,000 tons per month. In the Spring this figure was boosted to 28,000 or 30,000 tons per month and this rate was continued until December when an extra shift was added per week, increasing the monthly product to 34,000 tons.

The mine was operated on a two-shift basis almost the entire year, half the crew by day and half by night the first four days of each week. For the first eleven months overtime hoisting was confined to Fridays of each week, repair work being done on Saturdays and Sundays whenever necessary. In December the working schedule was stepped up to five days a week, hoisting accumulated ore on Saturdays and repair work all being done on Saturday night and Sundays.

Wages were increased in common with all the iron mining companies on November 16, 1936.

The year 1936 showed the largest tonnage produced since the Inland Steel Co. took over the Morris Mine. Ore reserves were, however, not decreased, in fact, there was more ore in sight at the end of the year than at the beginning. The reserves on the leased land were increased about 110,000 tons while the fee lands show an increase in reserve tonnage of approximately 61,000 tons.

Preparations were also made to drain a portion of the surface over the mine. Test wells were sunk by the Layne-Northwest Company to determine the character of the overburden and to plan the proper place to sink a well to unwater the glacial material lying on top the ledge.

Some new equipment was added, the most notable change being the transfer from endless rope stocking cars to self propelled larry cars.

2. PRODUCTION, SHIPMENTS & INVENTORIES:

a. Production

Grade		
Morris Standard	289,421	tons
Morris Siliceous	57,978	"
Total	347,399	"

Production from Fee & Leased Lands

	Leased	Fee	Total
Morris Standard	145,207	144,214	289,421
Morris Siliceous	35,440	22,538	57,978
Total	180,647	166,752	347,399
Percentage of Total	51.9	48.1	100.0

MORRIS MINE
ANNUAL REPORT
YEAR 1936

Percentage of Product from Fee Lands	
January - 1936	31.9%
February	37.1
March	45.6
April	49.8
May	48.5
June	45.4
July	46.2
August	48.4
September	56.4
October	56.3
November	48.9
December	56.9
Total for Year	48.1

The output from the mine since 1933 follows:

Grade	1936 Tons	1935 Tons	1934 Tons	1933 Tons
Standard Ore	289,421	181,233	110,956	63,255
Siliceous Ore	57,978	36,624	45,565	13,300
Total	347,399	217,857	156,521	76,555
Increase for 1936	129,542			

The following tabulation shows the division of product between fee and leased ore, that is, ore hoisted from The C. C. I. Co's lands and the Moore and Chase Leases.

	Moore & Chase Leases		C.C.I.Co's Land	
	Tons	% of Total	Tons	% of Total
1936	180,647	51.9	166,742	48.1
1935	187,679	76.5	57,781	23.5
1934	129,284	74.6	43,985	25.4
1933	103.487	82.0	22,709	18.0
Grand Total	601,097	67.5	291,217	32.5

The division between fee and leased ore is approximately 50/50 for 1936 but that condition will not prevail in the years to come because the bulk of the ore reserves are on the Moore & Chase Leases. However, as long as the Inland Company keep three contracts mining in sub level stopes on our lands to the East and South of Chase Lease No. 9, a high per cent of ore mined from our lands will be maintained.

b. Shipments

The ore shipped during 1936 was taken from the stockpile and pockets as shown.

Grade	Pocket Tons	Stockpile Tons	Total Tons
Morris Standard Ore	175,443	61,169	236,512 236612
" Siliceous "	43,621	20,652	64,373 64372
Total	219,064	81,821	300,885

MORRIS MINE
ANNUAL REPORT
YEAR 1936

Shipments from the Morris Mine since the Inland Steel Company acquired the lease follows:

Grade	1936 Tons	1935 Tons	1934 Tons	1933 Tons
Standard Ore	236,512	181,233	110,956	63,255
Siliceous "	64,373	36,624	45,565	13,300
Total	300,885	217,857	156,521	76,555
Increase for 1936	83,028			

The Inland Company continues to make shipments of Morris Standard and Morris Siliceous ore to charcoal furnaces for our account.

c. Ore in Stock

On December 31, 1936, the stockpile balances were as follows:

Morris Standard Ore	133,921	tons
" Siliceous "	6,538	"
Total	140,459	"

The ore carried over in previous years follows:-

December 31, 1933	49,641	tons
" " 1934	66,389	"
" " 1935	93,993	"
" " 1936	140,459	"

e. Production by Months

Month	Morris Standard Tons	Morris Siliceous Tons	Total Tons
January	23,206	3,209	26,415
February	22,093	3,552	25,645
March	23,503	3,660	27,163
April	24,351	4,558	28,909
May	23,459	5,598	29,057
June	22,479	6,976	29,455
July	24,399	6,051	30,450
August	21,992	6,246	28,238
September	25,037	5,832	30,869
October	23,914	4,970	28,884
November	24,572	3,513	28,085
December	30,416	3,813	34,229
Total	289,421	57,978	347,399

3. ANALYSIS:

Following are the analysis on the shipments of Morris Standard Ore:

Month	Tons	Iron Dried	Moisture	Iron Natural
January - 1936	2,104	59.54	10.56	53.25
February	942	60.60	10.60	54.18
March	1,239	59.47	11.21	52.81
April	598	59.04	11.28	52.38
May	34,675	58.60	10.49	52.45
June	39,688	58.28	10.51	52.15
July	31,691	59.08	10.43	52.92
August	25,394	59.89	10.43	53.64
September	37,303	58.64	10.49	52.49
October	26,383	58.75	10.19	52.77
November	25,320	58.49	10.45	52.38

√1937

MORRIS MINE
ANNUAL REPORT
YEAR 1936

Analysis of Siliceous Shipments follow:

Month	Tons	Iron Dried	Moisture	Iron Natural
January - 1936	553	52.16	10.35	46.76
February	130	50.50	9.75	45.58
March	201	51.12	10.31	45.85
May	5,598	51.54	9.72	46.53
June	9,582	51.03	9.62	46.12
July	9,675	51.85	9.29	47.03
August	11,824	50.77	9.49	45.95
September	10,619	52.06	9.71	47.00
October	6,894	57.51	9.41	46.66
November	5,081	53.40	10.22	47.94
December	1,574	51.00	9.07	46.38

The accumulated analysis of the ore as stocked follows. The first set of tables covers the Standard Ore and the second set the Siliceous Ore.

	Standard Ore		
	Tons	Iron Dried	Phos.
January	102,261	58.70	.069
February	123,412	58.77	.070
March	145,676	58.76	.067
April	169,429	58.75	.068
May	146,891	58.75	.068
June	129,682	58.75	.068
July	122,390	58.75	.068
August	118,988	58.75	.068
September	106,722	58.75	.068
October	104,253	58.75	.068
November	103,505	58.75	.068
December	133,919	58.71	.070

	Siliceous Ore		
	Tons	Iron Dried	Phos.
January	15,490	50.62	.062
February	18,912	50.71	.062
March	22,371	50.79	.061
April	26,929	50.79	.061
May	24,385	50.79	.061
June	21,779	50.79	.061
July	18,155	50.79	.061
August	12,578	50.79	.061
September	7,791	50.79	.061
October	5,867	50.79	.061
November	4,299	50.79	.061
December	6,541	50.23	.058

4. ESTIMATE OF ORE RESERVES:

	Ore Reserves as of Dec.31, 1935	Ore Reserves as of Dec.31, 1936	Difference
Chase Lease #26	26,140 tons	26,140 tons	None
" " #25	33,273 "	33,273 "	"
" " #24	36,405 "	92,310 "	+ 55,905
" " # 9	1,860,019 "	1,912,071 "	+ 52,052
C. C. I. Co. Lands	594,642 "	656,470 "	+ 61,828
Total	2,550,479 "	2,720,264 "	+169,785

MORRIS MINE
ANNUAL REPORT
YEAR 1936

To the difference of 169,785 tons shown should be added the year's production of 347,399 tons, or a total of 517,184 tons, which is the amount of new ore developed in 1936.

It will be noted that the ore on The C. C. I. Co's lands shows an increase comparable with Lease No. 9 and Lease No. 24. The increase on our fee lands is in two ore areas, No. 21 deposit in the Northeast corner of the 7th Level area, and in the Main or No. 33 Deposit South of Chase Lease No. 9.

Chase Lease No. 9 shows increases in all four deposits - "B", No. 21, No. 33 or Main Deposit, and No. 61. On Lease No. 24 the increase in ore area is confined to the Main Deposit.

A detail of the figures that show the changes follow:

Description	Estimate Dec. 31, 1935	Estimated 1936 Production Standard	Siliceous	Estimate by Deducting Production	Actual Engineer's Estimate	Difference
Above 7th Level #66	8,910	-	-	8,910	8,910	None
7-8th Level #66	9,281	-	-	9,281	9,281	"
Above 7th Level #74	777	-	-	777	777	"
7-8th Level #74	7,172	-	-	7,172	7,172	"
Total Chase Lease #26	26,140	-	-	26,140	26,140	"
Above 7th Level #36	1,328	-	-	1,328	1,328	None
D. D. Hole #90	6,627	-	-	6,627	6,627	"
D. D. Hole #93	1,988	-	-	1,988	1,988	"
Above 7th Level #74	12,994	-	-	12,994	12,994	"
7-8th Level #74	10,336	-	-	10,336	10,336	"
Total Chase Lease #25	33,273	-	-	33,273	33,273	"
Above 7th Level #35	1,477	-	-	1,477	1,477	None
Above 7th Level "Y"	4,939	-	-	4,939	4,939	"
Above 7th Level #62	1,114	-	-	1,114	1,114	"
East of Division Line	3,999	-	-	3,999	3,999	"
West of Division Line	979	-	-	979	979	"
7-8th Level #62	8,353	-	-	8,353	8,353	"
Above 7th Level #63	5,503	-	-	5,503	5,503	"
7-8th Level #63	10,041	-	-	10,041	10,041	"
Ore above 8th Level #33	-	4,693	58	- 4,751	55,905	60,656
Total Chase Lease #24	36,405	4,693	58	31,654	92,310	60,656
Above 7th Level #21	3,278	2,915	5,533	- 5,170	3,151	8,321
8th Level #21	-	-	-	-	-	None
Above 7th Level #61	72,094	29,589	4,391	38,114	52,307	14,193
7-8th Level #61	14,681	-	-	14,681	14,690	9
Above 7th Level	-	-	-	-	-	-
West Deposit	5,250	-	-	5,250	5,250	None
7-8th Level West Deposit	8,672	-	-	8,672	8,672	"
Above 7th Level "B"	201,394	31,734	13,972	155,688	198,343	42,655
7-8th Level "B"	419,567	-	-	419,567	474,243	54,676
Below 8th Level "B"	58,263	-	-	58,263	58,365	102
7-8th Level "C"	29,719	-	-	29,719	29,719	None
Below 8th Level "C"	31,406	-	-	31,406	31,406	"
Above 7th Level #33	7,636	8,939	243	- 1,546	1,042	2,588
7-8th Level #33	735,130	67,425	11,354	656,351	729,776	73,425
Below 8th Level #33	272,929	-	-	272,929	305,107	32,178
Total Chase Lease #9	1,860,019	140,602	35,493	1,683,924	1,912,071	228,147

MORRIS MINE
ANNUAL REPORT
YEAR 1936

Description	Estimate Dec. 31, 1935	Estimated 1936 Production Standard	Siliceous	Estimate by Deducting Production	Actual Engineer's Estimate	Difference
Above 7th Level #21	68,901	39,350	235	29,316	53,650	24,334
7-8th Level #21	8,344	-	-	8,344	8,022	- 322
Above 7th Level #33	70,930	35,101	4,737	31,092	26,921	- 4,171
7-8th Level East #33	223,055	2,280	750	220,025	221,676	1,651
7-8th Level South #33	169,019	67,397	16,701	84,921	227,836	142,915
Below 8th Level East #33	28,508	-	-	28,508	28,467	- 41
" " " South #33	9,347	-	-	9,347	73,360	64,013
7-8th Level "C"	8,100	-	-	8,100	8,100	None
Below 8th Level "C"	8,438	-	-	8,438	8,438	"
Total C.C.I.Co. Lands	594,642	144,128	22,423	428,091	656,470	228,379
Summary						
Chase Lease #9	1,860,019	140,602	35,493	1,683,924	1,912,071	228,147
" " #24	36,405	4,693	58	31,654	92,310	60,656
" " #25	33,273	None	None	33,273	33,273	None
" " #26	26,140	"	"	26,140	26,140	"
Total Lease Lands	1,955,837	145,295	35,551	1,774,991	2,063,794	288,803
C.C.I.Co. Fee Lands	594,642	144,128	22,423	428,091	656,470	228,379
Total	2,550,479	289,423	57,974	2,203,082	2,720,264	517,182
Ore in Stockpile- Dec. 31, 1936	93,947	133,921	6,538	140,459	140,459	-
TOTAL	2,644,426	423,344	64,512	2,343,541	2,860,723	517,182

6. SURFACE:

Drainage Project

In June 1936 the Layne-Northwest Company started to drill test wells to test the overburden on top the ledge over the Morris Mine workings. Three holes were first drilled 400 ft. apart over the North or foot side and then three more were drilled 400 ft. apart over on the South side of the property. One hole was also put in half way between the two rows. After the engineers had studied the data derived from sinking these test wells two more holes were drilled over on the Northwest side of the property between the ore bearing portion of the mine and the bed of old North Lake. These holes proved that there was very little water bearing formation or quicksand over the East end of the mine. It was finally decided that the only favorable place to plan to unwater the glacial drift was over on the Northwest side where there seemed to be a greater depth of water soaked drift than anywhere else. Preparations were being made at the close of the year to put down a drainage deep well pump with a capacity of about 1500 G. P. M.

Trestles

A new rock trestle was erected Southwest of the shaft. Because of the purchase of two new "Larry" cars it was necessary to rebuild and strengthen both ore and rock trestles. The new stocking cars were built by the Lake Shore Engine Works. They are driven by 15 h. p. motors, will operate on a 2% grade against the load, and cost $3,250 each.

MORRIS MINE
ANNUAL REPORT
YEAR 1936

7. UNDERGROUND:

An average of 16 mining contracts were employed underground during the year. The miners worked 4 shifts a week most of the year but in December this was boosted to 5 days a week. The work done by these contracts is described in detail as follows:

Development

Chase Lease No. 9

On the main 7th level in "B" Deposit a new crosscut was driven South for 100 ft. close to and parallel to the 1700 meridian and a new raise put up to mine the pillar of ore left between the main portion of "B" Deposit and the finger or off-shoot on the East end.

Over on the South side of "B" Deposit a new raise was started from the 8th level, continued to the North parallel with the 2000 West coordinate line up to the -10 ft. sub. At that point a crosscut was driven North to find the width of the ore and a main scraping drift was carried to the East for 185 ft. Raises were also carried up along the North side of the main drift to the 70 ft. or 7th level elevation where it is planned to start a new sub level stope to the South of the stoped out area above the 7th level.

The most important piece of development work accomplished during 1936 was the drifting and raising done in the extreme Southwest corner of the 8th level area. A new main level drift was carried West in ore along the South side of Chase Lease No. 9 for 240 ft. The breast of the drift encountered dike 90 ft. from the West line of Chase Lease No. 9 and so a crosscut was driven South which proved the ore at this point to be 100 ft. wide. A new triple compartment raise was then started on the West side of the crosscut on our fee lands to the South of the Moore & Chase leased area.

C. C. I. Co's fee lands South of Chase Lease No. 9

As mentioned just above, the main level crosscut on the 8th level found the main deposit to be 100 ft. wide along our West boundary. The extention of the ore body is over on Chase Lease No. 24. The new three-compartment raise was put up to the -90 ft. sub level. At this point a new scraping and transfer drift was driven parallel and only 12 ft. from the North line of our fee lands for a distance of 325 ft. Raises put up from this drift made it possible to open up two new sub level stopes.

Moore & Chase Lease No. 24

The extention of the Main or No. 33 Deposit was found along the East line of Lease No. 24 and a new drift and raises were driven at and from the -90 ft. elevation. A small stope was actually started on the -50 ft. sub level. No attempt was made to find the end of the ore. There may be a long extention to the Main Deposit.

Stoping

C. C. I. Co. Lands (Fee)

No. 21 Deposit

A new sub level stope was opened up in 1936 in the East end of No. 21 Deposit between the 6th and 7th levels. Raises were started from the Main or 110 ft. scraping sub, carried to the top of the ore and the new stope started at the 190 ft. elevation. An area 125 ft.

long was mined down to the 150 ft. elevation. In the mid-portion of the year this stope became quite wet, due no doubt to the cracking and caving of the hanging leading up to the old subs above the 6th level. Mining was stopped, the floor of the scraping sub was lagged over with plank, the sides of the drift were partitioned off with plank, making a trench in the center of the drift for the scraper to operate in. This scheme provided a fairly dry trench for the broken ore. In order to speed up operations a new raise was also put up from the main 7th level to the East end of the scraper and transfer drift.

Main Deposit

In the extreme Southeast corner of the Main or No. 33 Deposit, another sub level stope took out all the available ore between the main dike and a cross dike between the East line of Chase Lease No. 9 and the 1200 West coordinate line. The stope extended from the 180 ft. sub level down to the 100 ft. sub.

On the 130 ft. sub, on the 120, the 110, and partially on the 100 ft. sub level, a pillar of ore 70' x 110' was sliced between the jasper hanging and the main dike. All of this ore was radially sliced under timber.

On the main 7th level and one sub below, in the area between the East line of Chase Lease No. 9 and the limit of mining established 40 ft. East of the lease, two subs were worked out between the jasper hanging and the main dike.

In the Southwest side of the same or Main Deposit a fairly long strip East and West was stoped from the 7th level to the 20 ft. elevation. This stope averages about 50 ft. in height, is from 20 to 80' wide, and has a length of approximately 300 ft. The boundary line along the South side of Chase Lease No. 9 lies parallel with the side of the stope, about two-thirds of the stope being under our own fee lands and one-third of the ore stoped belonging to the Moore & Chase interests.

On the 10 ft. sub level it was decided to slice the ore and provide a timber mat for slicing operations below this sub level interval.

In the extreme Southwest corner of the 8th level area, the stope started last year at the 10 ft. elevation near the 2400 West coordinate line was mined down to the -80 ft. elevation or a vertical height of 90 ft. The face of this stope was carried from West to East on the West side of the 2400 West coordinate line. A new stope was also started with the idea of stoping in the opposite direction. This was made possible by working from the new raise from the new crosscut driven South near the West line of Chase Lease No. 9.

Chase Lease No. 9

No. 61 Deposit

The highest workings on Chase Lease No. 9 were in the North Central part of the mine above the 7th level. A small stope took out all the available ore in the Northeast corner of No. 61 Deposit between the 160' and the 200' sub levels. On the 190 ft. elevation and also on the 180 ft. sub level, an area 60' x 100' was sliced in the Central part of the deposit. Over on the West end, East of the limit of mining, a gang radially sliced on three subs - the 140, the 130, and the 120 ft. sub.

MORRIS MINE
ANNUAL REPORT
YEAR 1936

"B" Deposit

Very little ore was mined during the year from this deposit. A small stope took out a limited tonnage from the 210 ft. elevation down to the 190 ft. sub between the 1700 and 1800 West coordinate lines in the North Central portion of "B" Deposit. A small slice was also taken off the East side of the stope near the 1800 West coordinate line in the South Central part of the deposit. Another small area was stoped near the 130 ft. elevation over on the North side of the deposit between the 1800 and 1900 West meridians.

Main Deposit

Most of the gangs in the Main Deposit mined ore during the year by the sub level slicing system. Those gangs were concentrated in the middle of the main ore body between the East line of Chase Lease No. 9 and the 1700 West coordinate line. Slicing started on the 7th level over on the East side of Chase Lease No. 9, slicing was continued on the 70 or first sub below the 7th, and most of this sort of mining was confined to the 20, 10 and 00 subs for 350 ft. along the foot to the East of the 1800 West meridian. Trouble was experienced with sulphur in the ore in this area and a pillar of this high sulphur ore was left standing on the 00 sub level 50 ft. West of the 1600 West coordinate line. Water coming down the crotch in the footwall in the same ore area gave so much trouble that it was decided to drive a drainage level below the regular operating sub level to take care of the water. Early in the year crosscutting and raising along the footwall dike was attempted to divert the water. These schemes failed but the drainage drift parallel to the dike was successful in providing dry areas to mine in.

19. PUMPING

The following detail shows the % of the total pumping expense borne by the Morris Mine. It also clearly shows that the Morris Mine is paying an increasing proportion of the total pumping charges. It is understood that the reader is familar with the arrangements made to have the Inland Steel Company pump all the water from the Lloyd Mine.

	Inland Steel Company Morris Mine			C. C. I. Company Lloyd Mine		
	Amount	%	G.P.M.	Amount	%	G.P.M.
January	$ 1,194.56	67.98	225	$ 562.55	32.02	106.5
February	1,144.24	68.13	201	535.30	31.87	94
March	1,350.27	65.73	202	704.01	34.27	104
April	1,064.59	51.99	204	982.94	48.01	230
May	1,006.57	43.70	202	1,296.57	56.30	250
June	1,279.13	52.72	202	1,147.08	47.28	185
July	1,248.88	59.03	206	866.65	40.97	139
August	1,312.63	65.07	207	704.70	34.93	113
September	1,216.60	65.07	203	652.93	34.93	107
October	1,297.73	66.06	210	666.71	33.94	107
November	1,405.02	68.22	233	654.40	31.78	109
December	1,367.27	67.02	201	672.92	32.98	99
Total	14,887.49	61.20	Avg. 208	9,446.76	38.80	Avg 137
Year 1935	8,864.80	51.40		8,384.18	48.60	
" 1934	7,449.56	44.27		9,378.76	55.73	
" 1933	8,068.44	49.11		8,361.29	50.89	

TILDEN MINE
ANNUAL REPORT
YEAR 1936

1. GENERAL

Ore shipments from this property were started on April 23rd and terminated on November 4th, production totaling 291,341 tons. Loading operations were intermittent, and largely on a single shift basis until the beginning of September, after which the double shift schedule predominated. Ore was produced in all three pits in the following amounts: West Pit, 217,225 tons; East Pit 69,515 tons; Summit Pit, 4,601 tons. Of the production from Summit Pit, 4,231 tons or 92% was Low Phosphorus Grade.

At the beginning of the year, blast hole drilling was being carried on in all three pits, exploration drilling by diamond drill was being continued to the South of the West Pit. Exploration drilling by churn drill was started to the South of the East Pit, and to the East of Summit Pit. Contract stripping operations were begun by Lindberg and Sons on January 20th and were completed in May. A small amount of stripping was done by Company men in the East Pit later in the year.

A total of 9 blasts were made during the year, one of which was at Summit Pit. The other eight blasts were divided equally between the West and East Pits, four being made in each. The ore broken by these blasts has been estimated at 315,000 tons, of which 230,000 were in the West Pit, 75,000 in the East Pit and 10,000 in Summit Pit.

A third electric shovel of 2 yd. capacity was purchased for use in loading mixed and graded shipments from the West and East Pits.

Blast hole drilling was carried on in all three pits during the year, and test hole drilling by churn drill was done in both the East and Summit Pits. The information disclosed by the test drilling at Summit Pit was disappointing to the extent that further attempt to produce Low Phosphorus ore there will be abandoned. In the future, the Low Phosphorus grade can be produced by selective grading of the East Pit product with a result that an ore of higher iron content and lower cost will be produced.

Diamond drilling under E. & A. #680 was carried on throughout the entire year and is being continued into 1937.

A new 9" electric drill was purchased after a very satisfactory test run. A new bit dressing machine was also purchased with which to sharpen both the new 9" and the standard 6" bits.

The addition of the third shovel has solved a good many of the grading problems at the mine, and this condition will be further improved with the complete abandoning of the Summit pit until a future date, thus obviating the necessity of stockpiling the Summit Pit ore in the East Pit and reloading as a cargo is accumulated.

TILDEN MINE
ANNUAL REPORT
YEAR 1936

2. PRODUCTION SHIPMENTS & INVENTORIES

a. Production by Grades

	Tilden Silica	Tilden Silica #1	Low Phosphorus	Total
West Pit	217,225			217,225
East Pit	35,253	24,313	9,949	69,515
Summit Pit		370	4,231	4,601
	252,478	24,683	14,180	291,341

This production compares with 190,511 tons production in 1935, an increase of 100,830 tons.

b. Shipments

Shipments from the Tilden for 1936 were the same as the production figures of 291,341 tons.

c. Stockpile Inventories

There is no ore in stock at the Tilden Mine. Following is an estimate of the broken ore reserves in the several pits:

West Pit - - - - - - - - - - - -	19,087 tons.
East Pit - - - - - - - - - - - -	10,960 "
Summit Pit - - - - - - - - - - - -	7,040 "
Total Broken Ore Dec. 31, 1936-	37,087 tons.

The above figure compares with 13,428 tons at the end of 1935, an increase of 23,659 tons. These broken ore reserves will be available for early season shipping in 1937.

e. Product by Months

Month	Days Operated.	Average Daily Tonnage	Total Tons
April	3 (1-8 hr.) 4 (2-8 hr.)	1238	13,626
May	18 (1-8 hr.) 4 (2-8 hr.)	1348	35,040
June	11 (1-8 hr.) 8 (2-8 hr.)	1606	43,367
July	18 (1-8 hr.)	1988	35,790
August	19 (1-8 hr.)	1987	37,768
September	5 (1-8 hr.) 13 (2-8 hr.)	1504	46,648
October	28 (2-8 hr.) 1 (1-8 hr.)	1350	76,948
November	2 (1-8 hr.)	1077	2,154
Total	191	1525	291,341

TILDEN MINE
ANNUAL REPORT
YEAR 1936

2. PRODUCTION SHIPMENTS & INVENTORIES (Cont.)

f. Ore Statement

	1936 Tons	1935 Tons
On hand January 1, 1936	-	-
Output for year	291,341	190,511
Total	291,341	190,511
Shipments	291,341	190,511
Balance on hand	-	-
Increase in output	100,830	
Increase in shipments	100,830	

1935 - 77 - 1-8 hr. shifts and 22, 2-8 hr. shifts as tonnage was required.

1936 - 77 - 1-8 hr. shifts and 57, 2-8 hr. shifts as tonnage was required.

g. Delays

There were no serious mechanical or electrical delays during the year. The increase in lost time in shovel operations from 15½ hours in 1935 to 55½ hours in 1936 is due to a natural increase in minor breakdowns resulting from an increased production schedule in which three shovels were operated compared with two last year. The new #480 Marion electric 2 yard shovel was responsible for a considerable portion of the above delay due to the fact that minor adjustments and repairs were necessary during the breaking in period, after it had been assembled. The shovel was received June 27th and started to load on July 28th. Following is a record of the total time lost:

Shovels	Crushing Plant	Transportation Equipt.
55½ hrs.	7½ hrs.	18½ hrs.

h. Delays from Lack of Current

While there were no actual recorded delays from power failure, an annoying condition exists at the Tilden due to a slight voltage drop when any of the numerous motor units are operated under very heavy loads. This voltage drop, though momentary, has the effect of slowing up operations and is discussed at greater length later in this report under heading #15. (Power)

3. ANALYSIS

a. Average Mine Analysis on Output

Grade	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss on Ignition
Tilden Silica	39.45	.039	41.65	.09	.60	.28	.20	.013	.25
Tilden Silica #1	37.44	.017	44.59	.09	.45	.30	.15	.011	.20
Tilden Low Phos.	37.02	.009	46.65	.09	.45	.30	.15	.011	.20

TILDEN MINE
ANNUAL REPORT
YEAR 1936

3. ANALYSIS (Cont.)

b. Average Analysis on Straight Cargos

	Mine			Lake Erie		
	Iron	Phos.	Sil.	Iron	Phos.	Moist.
Tilden Silica	39.34	.039	42.09	39.72	-	1.89
Tilden Low Phos.	36.50	.009	46.56	37.27	.012	1.40

c. High Sulphur Ore

The high sulphur ore in the area stripped in the East end of the West Pit was successfully added to and mixed with the West Pit product throughout the loading season. The inclusion of this material increased the average sulphur content of the Tilden Silica grade from .011 to .013. Exploration drilling results were upheld in actual mining operations in that some small areas averaged nearly .200 sulphur; but loading was so regulated that only minimum amounts of this ore were included in any one cargo. Throughout the season, the presence of three shovels was vitally necessary to perform successful grading and still maintain production.

4. ESTIMATE OF ORE RESERVES

a. Developed Ore

1. West Pit (Tilden Silica)

Assumption: 14 cu. ft. equals 1 ton
10% deduction for rock.

Grade: Tilden Silica

Ore in sight Jan. 1, 1936, Upper Bench	356,972 tons
Ore developed in 1936, " "	480,000 "
Total, " "	836,972 tons.
Ore Mined in 1936, " "	217,225 "
Ore in sight Jan. 1, 1937, " "	619,747 tons.
Ore in sight Jan. 1, 1936, Lower Bench	1,870,000 "
Ore developed in 1936, " "	346,000 "
Total Developed Ore Jan. 1, 1937 West Pit	2,835,747 tons.

2. East Pit, including Summit Pit

Assumption: 14 cu. ft. equals 1 ton
10% deduction for rock.
Tonnage above 1500' Elevation
(Track grade from Crushing Plant)

Total ore in sight Jan. 1, 1936	5,399,946 tons
Ore mined in 1936	74,116 "
Total Developed Ore Jan. 1, 1937	5,325,830 tons.

TILDEN MINE
ANNUAL REPORT
YEAR 1936

4. ESTIMATE OF ORE RESERVES (Cont.)

a. Developed Ore (Cont.)

Of this total of 5,325,830 tons, approximately 2/5 is expected to grade above .015 Phos. and 3/5 below .015 Phos. These figures, based on 1930 diamond drill exploration, have so far not been proved by the small tonnage mined at the base of the hill. The tonnage explored covers so large an area that it will be years before much of it is actually developed by mining. Until such time as results prove otherwise, the available ore at the East Pit can conservatively be estimated as analyzing .026 in Phos. which by selective mining and grading, can be made to yield a product of which approximately 25% would run .015 Phos or lower.

The development of the Low Phosphorus area at Summit Pit has proved very disappointing. Test hole churn drilling in January, February and March has proved that the Phosphorus content of reserves in this vicinity is spotty and undependable. Production of any considerable tonnage from this pit with a guarantee of .010 Phos. or less would be impossible with the present available information. Because of this condition, plus the fact that operations with the present equipment are of higher cost than at the East Pit, it is the intention to produce the Tilden Low Phosphorus grade by carefully analyzing car shipments from the East Pit and choosing only those cars that run .015 in phosphorus or lower. The remaining cars will be shipped as Tilden Silica #1 or Tilden Silica.

3. Developed Ore as of January 1, 1937:

West Pit - - - - - - - - - -	2,835,747 tons
East Pit (Including Summit)	5,325,830 "
Total Tilden Mine - - -	8,161,577 tons.

b. Prospective Ore

In addition to the developed ore, there is probably a considerable tonnage to the North and East of the area developed by drilling at the East and Summit Pits. Directly north of the West Pit the ore is limited by a large dike, and North of this dike is a mass of mixed ore and jasper overlain by a swamp. To the Northeast of the West Pit, the depth of surface material makes further expansion in this direction impractical. It is probable that the ultimate expansion of operations will be a continuation of East Pit operations which will extend to include the reserves at Summit Pit, and those to the North and East of both Pits. In addition, there are the above mentioned reserves in the Lower Bench of the West Pit that are in excess of 2,000,000 tons. This ore can ultimately be recovered by mining with the present floor of the West Pit as the top of the face, and the elevation of the L. S. & I. main line as the new floor; the total height of face being approximately 50'.

TILDEN MINE
ANNUAL REPORT
YEAR 1936

4. ESTIMATE OF ORE RESERVES (Cont.)

c. Estimated Analysis of Reserves

1. West Pit	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Ign.	Moist.
Dried	40.00	.045	42.50	.120	.67	.48	.31	.014	.90	
Natural	39.00	.045	41.50	.118	.65	.47	.30	.013	.88	2.50

The above analyses have been changed from those reported previously due to the fact that the figures based on the original diamond drill exploration have not been born out in the production to date of well over a million tons. This is due largely to lean spots and small dikes that were not considered in the original estimate. The following analyses of East Pit reserves have been changed for the same reason.

2. East Pit	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Ign.	Moist.
Dried	37.00	.020	46.50	.120	.67	.48	.31	.014	.90	
Natural	36.25	.020	45.40	.118	.65	.47	.30	.013	.88	2.50

See 4-a-2 for further explanation of these analyses.

f. Estimate of production

The following tables show the estimated productions and analyses that can be produced during the 1937 season. The first table shows the tonnage obtainable if the ore were to be loaded and shipped without selective grading from the East Pit. The figures on the Summit Pit low phosphorus ore are based on the estimate of broken ore reserves that may be loaded out without further blasting.

The figures in the second table are based on the premise that low phosphorus ore will be produced by selective grading of the East Pit product, the remainder or higher phosphorus material being mixed with and shipped as Tilden silica grade.

1. - ESTIMATE OF 1937 PRODUCTION AS TO PITS

Grade	Tonnage	Iron	Phos.	Sil.	Sul.	Moist.	Iron Natl.
Tilden Silica West Pit	350,000	40.00	.040	42.50	.014	2.00	38.20
Tilden Silica #1 East Pit	100,000	37.00	.020	46.50	.011	2.00	36.25
Tilden Low Phos. (Broken ore Reserves in Summit Pit)	7,000	34.44	.015	49.50	.009	2.00	33.75
Total	457,000						

TILDEN MINE
ANNUAL REPORT
YEAR 1936

4. ESTIMATE OF ORE RESERVES (Cont.)

f. Estimate of Production (Cont.)

2. ESTIMATE OF PRODUCTION BY GRADING EAST PIT ORE

Grade	Tonnage	Iron	Phos.	Sil.	Sul.	Moist.	Iron Natl.
Tilden Silica (Includes West Pit and 50,000 tons. from East Pit)	400,000	39.00	.040	42.50	.014	2.00	38.20
Tilden Low Phos. (Selected from East Pit shipments)	50,000	37.00	.015	46.50	.011	2.00	36.25
Tilden Low Phos. Summit Pit	7,000	34.44	.015	49.50	.009	2.00	33.75
Total	457,000						

From the above tables it will be noted that the Low Phosphorus ore can be obtained only by analyzing each car and segregating those that contain the proper material. Using this method, a cargo can be obtained only by accumulating a sufficient number of cars and holding them for shipment. This arrangement, though not ideal, should prove more satisfactory than the current method of handling the product from Summit. The stockpiling of the Summit ore in the East Pit was not of itself a particularly expensive operation; but operations as a whole are of greater cost at Summit than at the East or West Pits due to poor equipment. The old steam operated shovel is slow and out of date, making efficient loading impossible. In view of the fact that the above conditions make the cost of the Summit product from 10 to 15 cents per ton higher than ore from the other two pits, and since low phosphorus ore is no longer available in any quantity, and also since the iron content is lower than at the other pits, it is deemed advisable to abandon operations at Summit for the present, and to obtain low phosphorus material from the East Pit.

5. LABOR AND WAGES

a. Comments
1. Labor

Labor conditions during 1936 were entirely satisfactory, as at no time was there any shortage of men. Employment was of necessity rather intermittent until full operations were resumed in the summer. The average number of employees was increased from 25 in 1935 to 40 in 1936. This increase was due to a heavier production schedule.

TILDEN MINE
ANNUAL REPORT
YEAR 1936

5. LABOR AND WAGES (CONT.)

a. Comments
1. Labor (Cont.)

The Gwinn District crushing plant crew was used occasionally for shifting tracks and other jobs when the Gwinn Plant was idle.

Company Group Insurance was introduced as of October 1st, with gratifying results, only one man declining to accept the opportunity of obtaining the protection offered under this plan.

N.R.A. regulations as regards labor, working hours, etc. were continued throughout the year, the only exceptions being emergency overtime work in a few instances.

b. Comparative Statement of Wages & Product

	1936	1935	Increase	Decrease
Product	291,341	190,511	100,830	
No. shifts & hours	77-1-8 hr.	77-1-8 hr.		
	57-2-8 hr.	28-2-8 hr.	29	
Average No. Men working	40	25	15	
Average daily wage	$ 4.22	4.29		.07
Tons per man per day	45.84	45.75	.009	
Labor cost per ton (Labor Stmt)	.099	.094	.005	
Labor cost per ton (Cost Sheet)	.110	.105	.005	
Total number of Days	6837.25	4163.75	2673.50	
Amount paid for Labor as per Labor Statement	$ 28,838.14	17,848.33	10,989.81	
Amount paid for Labor as per Cost Sheet	$ 32,032.56	19,954.54	12,078.02	

6. SURFACE

Routine repairs were made to equipment and buildings as necessary.

7. OPEN PIT OPERATIONS

a. Stripping

Stripping was done at both the West and East Pits, the operation in the former being a large operation that was done on contract by Lindberg and Sons. A relatively small amount of stripping was done in the East Pit by the regular force of mine employees, and the small steam shovel from Summit Pit.

TILDEN MINE
ANNUAL REPORT
YEAR 1936

7. OPEN PIT OPERATIONS (Cont.)

a. Stripping (Cont.)

In the West Pit, the contractor excavated the surface material with a 1½ yd. gasoline shovel and transported it to the swamp north of the pit by truck. A good showing was made in spite of severe cold weather during January, February and March. As the work progressed, a dragline was used, with the final clean up accomplished with the Company's hydraulic equipment at the contractor's expense. A total of 46,550 cubic yards was moved at a contract unit price of $0.30 per yard, the total payment equalling $13,965.00. In addition, the power line was moved from the area to be stripped at a cost of $319.14. The final cost was therefore $14,284.14 or $0.307 per cu. Yd. This expense was handled under E. & A. No. 686. The area uncovered by the above operation was somewhat of a disappointment in that the thickness of the overburden to the East was much greater than the average depth shown in test drill holes. Due to this, the amount of ore stripped per cubic yard was much smaller than anticipated.

Amount paid at contract unit price of $ .30 per cu. yd.	$13,965.00
Cost of moving power line	319.14
Total Cost	$14,284.14
Total yardage	46,550
Cost per cubic yard	$.307
Ore made available (Upper Bench)	480,000 tons.
Cost per ton of available ore (Upper Bench)	2.95¢

Inasmuch as the ore in the lower bench has also been benefited by the stripping, the final cost per ton stripped is given below:

Ore made available (Upper Bench)	480,000 tons.
Ore made available (Lower Bench)	346,000 "
Total ore made available, West Pit	826,000 tons.
Total cost	$ 14,284.14
Cost per ton, both benches	1.73¢

The stripping in the East Pit was done by the mine crew using the Erie shovel and two hired trucks. Conditions here were not conducive to low cost operations and the inadequacy of the shovel was apparent at all times. 2,085 cubic yards were moved at a cost of $0.616 per yard.

Labor	$540.80	
Supplies	193.15	
Truck Hire	551.15	
Total Cost	$1285.10	for 2,085 cu. yds.
Cost per yard	61.6¢	

Ore made available - 72,000 tons at a cost of 1.78¢ per ton.

TILDEN MINE
ANNUAL REPORT
YEAR 1936

7. OPEN PIT
OPERATIONS (Cont.)

a. Stripping (cont.)

In comparing the above figures, the much higher cost of the Company's stripping operations is due largely to the unfavorable conditions under which the work was done. The contractor, on the other hand, was able to make money at a unit price of practically one-half the Company's cost due to the large amount involved, the greater thickness of the material, easy access to his dumping grounds, and his ability to hire trucks and labor more cheaply.

In comparing the cost per ton of ore made available, the West Pit figure is the greater if only the tonnage in the Upper Bench is considered. If the ore in both benches is considered, the cost per ton of ore developed by stripping is practically the same in both pits. This is true in spite of the lower cost per cubic yard in the West Pit and was caused by the extreme thickness of the overburden.

b. Development

As discussed under the heading of Developed Ore (Paragraph 4-a-1), the results obtained by the test churn drill holes at Summit Pit were very disappointing, as they disclosed that the phosphorus content of the ore to the East and North of the Pit is very spotty and undependable. A total of six holes were drilled, several showing analyses of 0.020% Phos. and higher, with iron in the neighborhood of 34%. In view of these facts, and because of the higher cost of mining in this pit, it is logical to abandon Summit Pit operations and obtain the Tilden Low Phosphorus grade from the East Pit.

Further development was confined to the West Pit where stripping operations made available additional reserves of 826,000 tons, of which 480,000 will be mined from the upper bench, and 346,000 will be available when the lower bench is mined.

The stripping in the East Pit developed no new ore, as the ore reserves uncovered by this operation had already been outlined by test drilling.

f. Drilling, Blasting & Explosives

1. Drilling

The total churn drill footage for 1936 amounted to 12,209' as compared to 9,202' in 1935, an increase of 3,007'. Of the 12,209', 11,556' is the footage drilled by the regular 6" churn drills while the remaining 653' were drilled by the new 29-T Bucyrus-Armstrong 9" churn drill during November and December. There was no loss in the 9" holes but the loss in the 6" holes due to broken tools, caving holes and other mishaps amounted to 446', leaving a net effective footage of 11,110' of 6" holes. Of the 11,110', 463' was charged to test drilling in the East and Summit Pits.

TILDEN MINE
ANNUAL REPORT
YEAR 1936

7. OPEN PIT OPERATIONS (Cont.)

f. Drilling, Blasting & Explosives (Cont.)

1. Drilling (Cont.)

Churn drilling was carried on during the early months of the year, drilling both blast and test holes. The test hole drilling was stopped in both the East and Summit Pits in March. Drilling was continued throughout the year in both the West and East Pits preparing holes for the 1936 and 1937 seasons.

The cost of net footage drilled averaged $1.86 per foot, compared with $2.03 in 1935. This reduction in drilling cost was shown in spite of a wage increase of practically 10% which became effective on November 16th. Drilling costs varied from $1.36 per foot for 9" holes in the West Pit to $2.35 per foot for the 6" holes in the East Pit. The cost of $2.74 per foot for the 9" holes in the East Pit, drilled during the test run, is not indicative of the true cost as the amount paid to the Bucyrus-Armstrong Company was based on a cost per ton of burden drilled and not upon actual cost per foot.

Cost of Operating 6" Churn Drills in West Pit, 1936

Total footage of holes drilled	6,719'
Total footage of holes lost	200
Net available footage	6,519'

Operating	Labor	Supplies	Total	Cost Per Foot
Drilling at Mine	$ 4,833.42	$ 469.82	$ 5,303.24	.813
Sharpening Bits	443.13	122.09	565.22	.087
Pipe & Fittings	102.04	164.34	266.38	.041
Rope		543.80	543.80	.084
Drilling Tools		904.32	904.32	.139
Electric Power		431.47	431.47	.066
Truck and Tractor	379.68	101.99	481.67	.073
Total	$ 5,758.27	$2,737.83	$ 8,496.10	1.303
Maintenance				
Drills	506.02	1,034.57	$ 1,540.59	.236
Drill Sharpener		118.58	118.58	.018
Total	$ 506.02	1,153.15	1,659.17	.254
Total Maintenance and Operating	$ 6,264.29	$ 3,890.98	$ 10,155.27	1.557
Chambering holes	104.62		104.62	.016
Total	$ 6,368.91	$ 3,890.98	$ 10,259.89	1.573

TILDEN MINE
ANNUAL REPORT
YEAR 1936

7. OPEN PIT
OPERATIONS (Cont.)

f. Drilling, Blasting & Explosives (Cont.)

1. Drilling (Cont.)

Cost of Operating 9" Churn Drills in West Pit, (Dec., 1936)

Total footage of holes drilled	349'
Total footage of holes lost	0
Net available footage	349'

Operating	Labor	Supplies	Total	Cost Per Foot
Drilling at Mine	$ 233.68		$ 233.68	.669
Sharpening Bits	105.52	10.00	115.52	.332
Electric Power		20.00	20.00	.057
Truck & Tractor	96.32	10.00	106.32	.304
Total	$ 435.52	$ 40.00	$ 475.52	1.362

Cost of Operating 6" Churn Drills in East Pit, 1936

Total footage drilled	3716'
Total footage lost	246
Net available footage	3470'

Operating	Labor	Supplies	Total	Cost Per Foot
Drilling at Mine	$ 4170.45	$ 281.01	$ 4451.46	1.284
Sharpening Bits	384.16	128.57	512.73	.147
Pipe & Fittings	75.00	225.89	300.89	.087
Rope		402.35	402.35	.116
Drilling Tools		1085.17	1085.17	.313
Electric Power		448.19	448.19	.129
Truck & Tractor	387.04	112.86	499.90	.143
Total	$ 5016.65	$ 2684.04	$ 7700.69	2.219
Maintenance	$ 245.42	202.99	448.41	.129
Total Maintenance and Operating	$ 5,262.07	$ 2,887.03	$ 8,149.10	2.348

Cost of Operating 9" Churn Drills in East Pit (Nov., 1936 - Test Run)

Total footage drilled	304'
Total footage lost	0
Net available footage	304'

Amount paid Bucyrus Erie Co.	$ 834.45
Cost per foot	2.774

As explained above, the cost per foot of the 9" churn drilling in the East Pit is not indicative of true costs.

TILDEN MINE
ANNUAL REPORT
YEAR 1936

7. OPEN PIT
OPERATIONS (Cont.)

f. Drilling, Blasting & Explosives (Cont.)

1. Drilling (Cont.)

Cost of Operating 6" Churn Drills in Summit Pit, 1936

Total footage drilled	1121'
Total footage lost	0
Net available footage	1121'

Operating	Labor	Supplies	Total	Cost Per Foot
Drilling at mine	$ 890.46	$ 375.56	$ 1,266.02	1.129
Sharpening Bits	76.00	39.06	115.06	.102
Pipe & Fittings	51.70	100.17	151.87	.135
Drilling Tools		120.73	120.73	.108
Truck & Tractor	125.11	77.56	202.67	.181
Electric Power		120.55	120.55	.108
Total	$ 1,143.27	$ 833.63	$ 1,976.90	1.763
Roads	140.32	2.25	142.57	.128
Total	$ 1,283.59	$ 835.88	$ 2,119.47	1,891

Combined Cost of Operating Churn Drills, 1936

	Total Net Footage	Total Cost	Cost Per Foot
West Pit, 6" holes	6,519	$ 10,259.89	1.573
West Pit, 9" holes	349	475.52	1.362
East Pit, 6" holes	3,470	8,149.10	2.348
East Pit, 9" holes	304	834.45	2.744
Summit Pit, 6" holes	1,121	2,119.47	1.891
Total	11,763	$ 21,838.43	1.856

2. Blasting

In the hope of reducing drilling and blasting costs, a new 29-T Bucyrus-Armstrong 9" electric churn drill was ordered on condition that it pass certain tests. This drill completed its test run in the East Pit in the latter part of November. Under the terms of the proposal, the Bucyrus-Erie Company guaranteed to drill at least 12 feet per shift as compared with an average of 8 feet per shift in the same ground with our 6" drills. The 9" drill actually completed 304' in 14.01 shifts or an average of 21.7' per shift, an increase of practically 10' per shift over their guarantee. Upon completion of the test run the drill was purchased and moved to the West end of the West Pit to drill for next season's blasting.

TILDEN MINE
ANNUAL REPORT
YEAR 1936

7. OPEN PIT
OPERATIONS (CONT.)

f. Drilling, Blasting & Explosives (Cont.)

2. Blasting (Cont.)

The bit dressing machine that came with the new drill has been installed in a separate building as there was not enough space in the blacksmith ship to accommodate it. This new machine has proved very satisfactory and modern, Equipment was purchased for use in this machine for sharpening 6" bits as well as the 9", replacing the present Armstrong sharpener which is completely out of date.

In the original agreement our Company was required to pay the Bucyrus-Erie Company for the footage drilled during the test. The amount to be paid was based on a price of 10.6 cents per ton of burden drilled whether the machine was accepted or not. The holes were not blasted but the burden has been estimated at 13,511 tons using our factor of 13.5 cubic feet per ton. On their comparative data sheet, submitted with the proposal, they use 21.3 long tons per foot of 6" hole in computing our drilling costs per ton of burden. Using the correct factor of 13.5 cubic feet per ton, this figure should have been 26.07 tons per foot of 6" hole; which changes the cost per ton from 10.6 cents to 8.65 cents. The cost for 13,511 tons would then be $1,166.00 from which we have subtracted $331.55 for labor and supplies furnished by us, leaving a total cost of drilling of $834.45. This figure was accepted as satisfactory by the Bucyrus-Erie Company.

The results of the test run indicate that ore produced from the 9" holes will be considerably cheaper than that formerly produced by the 6". Fewer holes are necessary and both faster and cheaper drilling can be obtained. Further, it is probable that a sufficient charge can be placed in the 9" holes to permit the blasting of faces up to 150' in height, a condition that was not possible with 6" holes. This will be a distinct advantage with mining operations in the East Pit eventually reaching a point where the face will be higher than 100'.

Our present results with the 9" holes while extremely satisfactory as to speed and cost of drilling are as yet inconclusive since none of the 9" holes have been blasted to date.

Nine primary blasts were made during the year, 4 at the West Pit, 4 at the East Pit and one at Summit, which broke an estimated total of 315,000 tons of ore. We are still having a little difficulty in completely shattering the ore to reduce secondary blasting, and at the same time keep from scattering the material about the floor of the pits. However, careful planning and calculating of the loads and burden keep these difficulties at a minimum. Following is a tabulation of blast results:

TILDEN MINE
ANNUAL REPORT
YEAR 1936

7. OPEN PIT OPERATIONS (Cont.)

f. Drilling, Blasting & Explosives (Cont.)

2. Blasting (Cont.)

Blast Number	Location	Date	No. of Holes	Footage	Pounds Powder	Estimated Tons	Tons Ore per Pound Powder
1	Summit Pit	4-18-36	11	537	3,400	10,000	3.0
2	West Pit	4-25-36	30	2,904	23,750	80,000	3.3
3.	East Pit	5-22-36	18	1,350	10,000	35,000	3.5
4	West Pit	5-26-36	18	1,690	13,400	45,000	3.5
5	West Pit	7-16-36	38	2,035	13,500	45,000	3.3
6	East Pit	8- 8-36	3	205	1,200	4,000	3.3
7	East Pit	8-31-36	8	692	5,200	16,000	3.1
8	East Pit	10-5-36	8	747	6,700	20,000	3.0
9	West Pit	10-9-36	34	2,244	20,100	60,000	3.0

Secondary blasting caused considerable expense and trouble during the 1936 season. A large portion of this was due to three missed holes, one of which was in the East end of the West Pit and the other two on the North edge. The failure of these three holes necessitated extremely careful loading in order to avoid accidental discharge of the powder from them. In all cases it was possible to shoot the lower portions of these holes after the broken portion had been uncovered by loading. However, the large chunks of ore resulting from these failures had to be drilled and blasted by hand. Also several men were employed during the greater part of the loading season drilling and blasting out high spots in the floors of both pits. To date it has been almost impossible to completely shatter the material at the toe of the blast, thus necessitating this hand work to secure an even grade on the Pit floors. The field blast at the West end of the West Pit had the effect of shattering the material back of the blast in the undrilled portion of the face. This back-break caused cracking and shattering which makes subsequent drilling in that area extremely difficult.

STATEMENT OF COST OF EXPLOSIVES USED FOR YEAR ENDING DECEMBER 31, 1936.

Primary Blasting

Kind	Quantity	Price	Amount
Gelamite #2	40,650 lbs.	$ 11.56	$ 4,700.63
40% LF Gelatine	10,900 "	10.16	1,108.00
60% LF "	2,500 "	11.90	297.50
80% LF "	29,300 "	15.53	4,551.74
90% LF "	16,400 "	18.00	2,953.51
Total Powder	99,750 lbs.	$13.63	$ 13,611.38

TILDEN MINE
ANNUAL REPORT
YEAR 1936

7. OPEN PIT
OPERATIONS (Cont.)

f. Drilling, Blasting & Explosives (Cont.)

2. Blasting (Cont.)

Blasting Supplies	Quantity	Price	Amount
#2 Wire Countered C. B. Fuse	3,036 ft.	$ 64.33	$ 195.39
Plain C. Bickford Fuse	2,882 "	42.00	121.03
Double C. Bickford Fuse	10,426 "	47.75	496.37
Total	16,344 ft.		$ 812.79
Total Powder, carried from previous page			13,611.38
TOTAL COST			$ 14,424.17

Total Ore Blasted in 1936	315,000 tons
Pounds of Powder per Ton of Ore	.32
Cost per Ton for Powder	.043
Cost per Ton for Fuse, Caps, etc.	.003
Cost per Ton for all Explosives	.046
Average price per Pound for Powder	.136

Secondary Blasting

Kind	Quantity	Price	Amount
60% Gelatine	5,900 lbs.	$ 11.46	$ 676.10
Blasting Supplies			
#6 Electric Blasting Caps	400	4.24 (c)	16.95
Connecting Wire	6'	.40	2.40
Hot Wire Lighters - 7"	1,500	6.75 (M)	10.13
Cap Crimpers	2	1.00 (ea.)	2.00
Crescent Fuse	29,000'	5.58	161.89
#6 Blasting Caps	7,000	11.29	79.05
Total			$ 272.42
TOTAL COST			$ 948.52

Product	291,341 tons.
Pounds of Powder per Ton of Ore	.13
Cost per Ton for Powder	.002
Cost per Ton for Fuse, Caps, Etc.	.001
Average price per Pound for Powder	.114

TILDEN MINE
ANNUAL REPORT
YEAR 1936

7. OPEN PIT
OPERATIONS (Cont.)

f. Drilling, Blasting & Explosives (Cont.)

2. Blasting (Cont.)

COMBINED TOTAL BLASTING COST

Kind	Quantity	Price	Amount
Gelamite #2	40,650 lbs.	$ 11.56	$ 4,700.63
40% LF Gelatine	10,900 "	10.16	1,108.00
60% LF "	8,400 "	11.59	973.60
80% LF "	29,300 "	15.53	4,551.74
90% LF "	16,400 "	18.00	2,953.51
Total Powder	105,650 lbs.	$ 13.53	$14,287.48
Blasting Supplies			
#6 Electric Blasting Caps	400	4.24 (c)	16.95
#2 Wire Countered C.B. Fuse	3,036 ft.	64.33	195.39
Plain Cordeau Bickford Fuse	2,882 ft.	42.00	121.03
Double " " "	10,426 ft.	47.75	496.37
Connecting Wire	6 lbs.	.40	2.40
Hot Wire Lighters - 7"	1,500	6.75 (M)	10.13
Cap Crimpers	2	1.00 (ea.)	2.00
Crescent Fuse	29,000	5.58 (M)	161.89
#6 Blasting Caps	7,000	11.29 (M)	79.05
Total Supplies			$ 1,085.21
TOTAL - ALL EXPLOSIVES -			$ 15,372.69

WEST PIT	Tons
Broken Ore remaining year 1935	6,312
Blasted 1936	230,000
Total	236,312
Ore Shipped	217,225
Estimated Ore on hand, December 31, 1936 ...	19,087

EAST PIT	
Broken Ore remaining Year 1935	5,475
Blasted 1936	75,000
Total	80,475
Ore Shipped in 1936	69,515
Estimated Ore on hand, December 31, 1936 ...	10,960

SUMMIT PIT	
Broken Ore remaining year 1935	1,641
Blasted 1936	10,000
Total	11,641
Ore Shipped in 1936	4,601
Estimated Ore on hand, December 31, 1936 ...	7,040

TILDEN MINE
ANNUAL REPORT
YEAR 1936

7. OPEN PIT
OPERATIONS (Cont.)

f. Drilling, Blasting & Explosives (Cont.)

3. Statement of Cost of Drilling and Blasting 315,000 tons of Ore.

Net Feet of Holes Drilled - 8,032', Lost 319'.

Drilling Cost Operating	Labor	Supplies	Total	Cost Per.Ft.	Cost Per Ton
Drilling at Mine	$ 7,021.18	1,226.84	8,248.02	1.042	
Sharpening Bits	709.86	306.89	1,016.75	.126	
Pipe & Fittings	228.74	264.85	493.59	.051	
Rope		546.16	546.16	.066	
Drilling Tools		900.00	900.00	.112	
Electric Power		722.12	722.12	.089	
Truck & Tractor	857.79	598.95	1,456.74	.180	
Total Operating	$ 8,817.57	4,565.81	13,383.38	1.666	
Maintenance					
Drills	$ 417.71	826.36	1,244.07	.152	
Drill Sharpener		118.48	118.48	.014	
Total Maintenance	$ 417.71	944.84	1,362.55	.166	
Total Operating and Maintenance	$ 9,235.28	5,510.65	14,745.93	1.832	
Less 463' Drilling charges to Testpitting, etc			1,217.13		
Total Cost 1936			13,528.80		
4372' drilled in 1935			10,152.90		
Total Drilling			23,681.70	1.91	.075
Primary Blasting Cost					
Labor Loading Holes	446.00	[illegible]	446.00		
Explosives		14,424.17	14,424.17		
Other Supplies		219.17	219.17		
Total Blasting	446.00	14,643.34	15,089.34		.048
Grand Total Operating, Maintenance and Primary Blasting			$ 38,771.04		.123

Classification of the above cost under the heading for each pit is as follows:

	Number of Holes	Combined Cost	Tons	Cost Per Ton
West Pit	120	27,570.59	230,000	.120
East Pit	37	9,671.02	75,000	.128
Summit Pit	11	1,529.43	10,000	.153
Total	168	38,771.04	315,000	.123

The reduced costs as compared with 1935 are due to a larger production and wider spacing of holes. The higher cost of operations at Summit Pit are again apparent.

TILDEN MINE
ANNUAL REPORT
YEAR 1936

7. OPEN PIT
OPERATIONS (Cont.)

g. Loading Operations

Ore shipments were begun on April 23rd and continued as needed until November 4th when the last cargo was loaded and shipped. Operations were largely on a single shift basis until September, after which the schedule was stepped up to two shifts per day for the remainder of the season. Little loading was done at Summit Pit, which produced only 4,601 tons of the total of 291,341. This was due to the disappointing results obtained in the test drilling and necessitated an increase in East Pit production in order to obtain the Low Phos. grade by selective loading. This selective loading, plus the fact that the high sulphur ore from the West Pit had to be mixed in small quantities, made a third shovel absolutely necessary. On June 27th, a #480 Marion electric 2 yard shovel with caterpillar treads was received from the Greenway Mine, Mesaba Range. This shovel, hereafter referred to as #46, while smaller and lighter than the other two, is faster and more mobile. These facts are a distinct advantage in moving from one pit to another as demanded for grading of the product from the two large pits. However, this new shovel is far too small for loading from a high face. The boom is so short that the shovel cannot be worked against a high pile without extreme danger to the operator from falling material. While this shovel is faster than the other two now in use the small capacity of the dipper makes it actually much slower. Although it had been used only a year or so before delivery at this property it was in very poor condition and had to be extensively repaired before being put into use. Further, it was responsible for a number of delays during the breaking in period after its assembly.

One of the West Pit blasts produced a considerable tonnage that ran over .030% in Sulphur. In order to handle this ore, and still keep the average sulphur analysis down to normal, it was necessary to carefully sample each car in order to mix in the right amount of the high sulphur material in any one cargo. As soon as samples showed that too great a proportion of the high sulphur material was being loaded the width of the shovel cut in this area was restricted to decrease this ratio. Loading was regulated so as to keep the average analysis down to .020% Sulphur or less. As explained under previous headings the low phosphorus grade was produced from the East Pit product by sampling cars and holding out those that ran low enough in phosphorus. The others were mixed and shipped with the West Pit ore as Tilden Silica Grade. In these mixing operations the third shovel was vitally necessary although it would have been much more satisfactory if it had been larger. Shipments of 24,000 tons for the Globe Iron Company of a grade of .021% Phos. were handled in the same manner. During 1937, low phosphorus orders will be handled this way without the necessity of stockpiling unless there is an urgent demand for Summit Pit ore.

In order to avoid a restricted loading area in the future, it will be necessary to lengthen and widen the East Pit to the East, to facilitate handling of the increased production that will be necessary. At some future time, it is expected that the East Pit will be extended to include Summit Pit, at the East Pit floor elevation.

TILDEN MINE
ANNUAL REPORT
YEAR 1936

8. COST OF OPERATING

a. Comparative Mining Costs

	1936	1935	Increase	Decrease
Production	291,341	190,511	100,830	
Average Daily Product	1,525	1,341	184	
Tons per man per day	42.61	45.75		3.14
Number of days Operating	191	130	61	
Number of shifts & hours	77-1-8 hr.	86-1-8 hr.		
	57-2-8 hr.	22-2-8 hr.		
Cost				
Pit Operating Accounts	.366	.354		
Pit General Accounts	.051	.055		
Cost at mine per cost sheet	.417	.409		
Depreciation				
Plant and Equipment	.031	.045		
Taxes	.012	.027		
Stripping	.019	.005		
Grand Total Cost at Mine	.479	.486		
Expense beyond Mine				
Freight - Rail	.640	.640		
Lake Freight	.760	.760		
Cargo Insurance & Analysis	.010	.010		
Shrinkage	.011	.011		
TOTAL COST LOWER LAKES	1.90	1.907		

b. Detailed Cost Comparison

1. Days and Shifts

In 1935, the mine operated on a curtailed basis for the first half of the shipping season before speeding up the loading schedule. Shifts worked in 1936 totaled 191 as compared to 130 in 1935, an increase of 61 eight hour shifts.

2. Production

Production in 1936 was 291,341 tons, an increase of 100,830 tons over 1935 when 190,511 tons were shipped. The average daily product was increased 184 tons due to a larger number of 2-8 hour days worked in 1936 and due to the addition of a third shovel.

3. Cost of Production

The 1936 cost on cars remained practically the same due to comparable conditions. The 10% wage increase that became effective on November 16th had little effect on these costs.

TILDEN MINE
ANNUAL REPORT
YEAR 1936

8. COST OF OPERATING (Cont.)

b. Detailed Cost Comparison (Cont.)

4. Open Pit Costs

	1936	1935	Increase	Decrease
Shifts and Hours	77-1-8 hr. 57-2-8 hr.	77-1-8 hr. 22-2-8 hr.	35-2-8 hr.	[illegible]
Production, Tons	291,341	190,511	100,830	
Average Daily Product	1,525	1,341	184	
Number of Days worked	191	130	61	

PIT OPERATIONS	1936		1935		Increase		Decrease	
Direct Ore	Amount	Per Ton	Amount	Per Ton	Amount	Per Ton	Amount	Per Ton
1. Drilling & Blasting.....	44,069.98	.151	28,364.86	.149	15,705.12	.002		
2. Power Shovels Operating.....	8,399.77	.029	6,510.54	.034	1,889.23			.005
3. Power Shovels Maintenance	9,002.47	.031	7,698.17	.040	1,304.30			.009
4. Locos. & Cars Operating.....	8,360.84	.029	5,629.80	.030	2,731.04			.001
5. Locos. & Cars Maintenance.....	3,346.99	.011	750.21	.004	2,596.78	.007		
6. Tracks,Expense....	5,279.79	.018	1,900.29	.010	3,379.50	.008		
TOTAL DIRECT ORE	78,459.84	.269	50,853.87	.267	27,605.97	.002		
General Pit Expense								
8. Water Supply.....	443.72	.002	166.41	.001	277.31	.001		
10. Crushing & Screening	19,417.13	.067	11,339.99	.060	8,077.14	.007		
11. General Open Pit Exp.	5,348.38	.018	3,048.65	.016	2,299.73	.002		
12. Open Pit Supts.....	1,607.40	.006	1,704.00	.009			96.60	.003
14. Waste Pile Expense..			219.88	.001			219.88	.001
15. Exploration Drilling	1,217.13	.004			1,217.13	.004		
TOTAL GENERAL EXP.	28,033.76	.097	16,478.93	.087	11,554.83	.010		
TOTAL PIT OPERATION..	106,493.60	.366	67,532.80	.354	38,960.80	.012		

TILDEN MINE
ANNUAL REPORT
YEAR 1936

8. COST OF OPERATING (Cont.)

GENERAL MINE EXPENSE	1936 Amount	1936 Per Ton	1935 Amount	1935 Per Ton	Increase Amount	Increase Per Ton	Decrease Amount	Decrease Per Ton
16. Unempl. Insurance Tax.	670.27	.002			670.27	.002		
17. Vacation Expense.....	746.10	.003			746.10	.003		
18. Insurance	352.22	.001	134.94	.001	217.28			
19. Mining Engineering....	1,246.90	.004	1,154.10	.006	92.80			.002
20. Mech.& Elec. Engrg....	672.68	.002	638.98	.003	33.70			.001
21. Analysis & Grading....	3,220.26	.011	2,193.47	.012	1,026.79			.001
22. Personal Injury.....	1,844.28	.006	1,235.30	.006	608.98			
23. Geological	249.16	.001	294.74	.002			45.58	.001
24. Safety Department.....	160.39	.001	56.53	.000	103.86	.001		
25. Welfare Expense.....	461.88	.002	512.95	.003			51.07	.001
26. Special Expense.....	618.17	.002	607.13	.003	11.04			.001
27. Ishpeming Office.....	1,510.95	.005	1,244.12	.007	266.83			.002
28. Saranac Invest. Exp...	235.20	.001	185.31	.001	49.89			
29. Mine Office.....	2,953.26	.010	2,179.13	.011	774.13			.001
TOTAL GENERAL MINE EXP...	14,941.72	.051	10,436.70	.055	4,505.02			.004
Cost of Production.....	121,435.32	.417	77,769.50	.409	43,665.82	.008		.008
30. Deprn.Plant & Equipt..	9,072.74	.031	8,625.31	.045	447.43			.014
31 Amortization Stripping.	3,456.24	.012	952.56	.005	2,503.68	.007		
32. Taxes.....	5,491.34	.019	5,148.98	.027	342.36			.008
Cost at Mine.....	139,455.64	.479	92,496.35	.486	46,959.29			.007
33. Inventory Adjustment..	7.90		10.86				2.96	.007
TOTAL COST AT MINE.....	139,463.54	.479	92,507.21	.486	46,956.33			.007

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

2. Power Shovels - Operating.
The decrease in cost of .005 is due to the increase in production and a slightly lower power rate.

3. Power Shovels - Maintenance.
The decrease in this item of .009 is due to the fact that extensive repairs had to be postponed until after the loading season.

5. Locomotives & Cars - Maintenance
The increase of .007 is due to the fact that numerous expensive repairs were postponed during the last several years. The necessity for these repairs accumulated to a point where all the rolling stock had to be completely overhauled. Repairs to No. 4 Locomotive alone were in excess of $1,000.00.

6. Track Expense
The increase of .008 in this item is due to the same conditions that affected item No. 5.

TILDEN MINE
ANNUAL REPORT
YEAR 1936

8. COST OF OPERATING (Cont.)

b. Detailed Cost Comparison (Cont.)

10. Crushing & Screening
The increase of .007 in this item is due to the same conditions that affected Items 5 and 6.

12. Open Pit Superintendence
The decrease of .003 was due to the larger production.

15. Exploration Drilling
The increase of .004 is due to the fact that there was no exploration drilling in 1935.

16. Unemployment Insurance Tax
This expense of .002 was a new item in 1936 and was not incurred during previous years.

17. Vacation Expense
Same as No. 16.

30. Depreciation of Plant & Equipment.
This decrease of .014 is due to changes in the depreciation rates that were instituted in December and made retroactive to January 1, 1936.

31. Amortization of Stripping
The increase of .007 per ton is due to the larger thickness of the material removed and, as shown in Paragraph 7 - a, is not large enough to cover actual costs.

32. Taxes
The decrease of .008 is due to the increase in production.

Idle Expense

	Labor	Supplies	Total
January.....	$ 1,025.77	2,120.94	3,146.71
February.....	1,393.20	1,564.34	2,957.54
March.....	1,579.71	2,686.48	4,266.19
April.....	1,142.32	617.84	1,760.16
November.....	2,615.50	3,399.46	6,014.96
December.....	3,140.66	2,504.21	5,644.87
Total.....	$ 10,897.16	$ 12,893.27	$ 23,790.43

The table above shows the actual Idle Expense incurred during 1936 and is included in all of the previously listed cost items. The total amount is a increase of practically $10,000.00 over 1935. An explanation of this follows:

During the past few years the curtailed activities at this property necessitated extreme economy in order to keep costs down. As a result of this, all repairs that were not absolutely necessary were postponed as

TILDEN MINE
ANNUAL REPORT
YEAR 1936

8. COST OF OPERATING (Cont.)

b. Detailed Cost Comparison (Cont.)

Idle Expense (Cont.)

long as possible. The day of reckoning arrived this year with the result that practically all equipment had to be thoroughly overhauled in preparation for 1937 operations. These repairs were started immediately after the end of the shipping season.

9. EXPLORATIONS AND FUTURE EXPLORATIONS

Explorations consisted of test hole drilling at the East and Summit Pits, and of diamond drilling south of the West Pit and north of the East Pit.

As previously explained, the test hole drilling at Summit Pit disclosed reserves of a spotty and unpredictable phosphorus content, and completely discouraged hopes of economically producing any amount of Low Phosphorus ore from this Pit. These test holes were responsible for the decision to abandon low Phosphorus production at Summit and to produce this grade at the East Pit.

In the diamond drilling campaign that was carried on under E. & A. #680; six holes were drilled and No. 17 deepened. Holes Nos. 48, 49, 50, 51 and 53 were drilled South of the West Pit and #52 North of the East Pit. Nos. 52 and 53 were being continued at the end of the year. Holes Nos. 48, 49, 50, 51 and 17 all encountered the footwall at various depths without disclosing any appreciable amount of high grade ore. An exhaustive discussion of this drilling will be found in the report of the Geological Department.

10. TAXES

Tilden Township Tilden Mine	1936 Valuation	 Taxes	1935 Valuation	 Taxes
N½ of Sec. 26, 47-27	$ 170,000	4,019.09	$ 145,000	3,696.05
Personal, Supplies, Equipt.	60,000	1,417.88	55,000	1,401.95
Total	$ 230,000	5,436.97	$ 200,000	5,098.00
Collection Fees		54.37		50.98
Total Tilden Mine	$ 230,000	5,491.34	$ 200,000	5,148.98

11. PERSONAL INJURY

There were no lost time accidents at the Tilden property during 1936.

TILDEN MINE
ANNUAL REPORT
YEAR 1936

12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION

The regular force was used to dismantle the old round house in the East end of the West Pit which had been used as a storage shed. The materials from this building were used to construct a building on the hill to the North of the crushing plant. This structure is now being used to house the new Bucyrus-Armstrong bit dressing machine. This new arrangement is a great improvement over the old one of transporting the bits to the blacksmith shop which is on the level of the pit floor.

A new road was constructed by the stripping contractor with earth removed from the ore body. This road gives access to the floor of the West Pit from the main road back on the hill and has proved a great convenience for transporting heavy equipment to and from the Pit.

At the present time no new construction is being considered.

13. EQUIPMENT AND PROPOSED EQUIPMENT

a. Shovels & Crushers

As previously noted, a new Marion #480 electric 2 yard shovel was received and used during the 1936 loading season. It was found to be indispensable to loading operations where selective grading and mixing were being carried on. After being reconditioned, this shovel and the other two were operated throughout the year without extraordinary repairs.

Due to the fact that during the last few years expensive repairs were necessarily held to a minimum, the condition of the shovels at the beginning of the 1936 loading season was none too good. With the heavy loading schedule we were very lucky to get through the year without a serious breakdown in one or more of the units which would have caused extensive delay and repairs.

The large 42" gyratory crusher had worn to such an extent that, toward the end of the season, the material passing through it was large enough to plug the small 10" crushers. Inasmuch as it was impossible to shut down this crusher for the replacing of the crushing mantle, it was necessary to keep two additional men in the crusher house to aid in feeding the small crushers to avoid blocking them. At the end of the year the work of replacing the crushing mantle so as to produce properly sized material was well underway.

b. Drills & Equipment

A discussion of the new 9" electric drill can be found under a previous heading. It suffices to say here that with the information at hand, the operation of this new drill should prove very satisfactory and efficient, although no blasting data on the new size holes with increased spacing is yet available.

TILDEN MINE
ANNUAL REPORT
YEAR 1936

13. EQUIPMENT AND PROPOSED EQUIPMENT

b. Drills & Equipment

The bit dressing machine that was purchased with the drill handles the work of sharpening both sizes of drills in a modern and efficient manner, although there is reason for believing that the present 15 H.P. motor that operates the machine will have to be replaced with a larger unit to insure satisfactory results under a speeded up schedule of operations. It is our belief that this difficulty is due entirely to a drop in voltage between the Mine transformer and the Sub-station. This voltage drop prevents the present motor from operating properly under heavy loads. This same condition is apparent throughout the property.

14. MAINTENANCE AND REPAIRS

An extensive program of repair work was well under way at the end of the year, making ready for a heavy operating schedule in 1937. An attempt is being made to have all equipment in good condition so as to keep lost time to a minimum during the coming season.

All three shovels are being completely overhauled.
Three locomotives have been or will be sent to the General Shops for a complete overhauling.
All other rolling stock is being completely reconditioned.
The crushers are being dismantled and overhauled with any extensive work being done at the General Shops. Included in this work is the replacing of the mantles on the 42" crusher.
All electric drills and equipment are being repaired as needed.

15. POWER

As previously mentioned under heading 2-h (Delays from lack of current) there is a condition at the Tilden Mine that is responsible for a number of small, though annoying delays. We believe this condition is caused almost entirely by the distance between the mine transformer and the nearest sub-station which is several miles away. Under present working conditions, it frequently happens that the volume of available power transmitted to the mine from this distant sub-station is temporarily insufficient to maintain the correct voltage. This voltage drop, though it may be only 10% or so, is large enough to stall the motors when working under a heavy load. This failure is apparent when the shovels are attempting to lift a large chunk, when the crusher is heavily loaded, and when the bit dressing machine is working under heavy conditions. It has been suggested that the last situation be handled by replacing the motor with one of higher capacity (15 H.P. to 25 H.P.) which will be able to handle the heavy load even though the voltage drops slightly. This method would be out of the question in the case of the electric shovels, drills and crushers. In the future it may become necessary to

TILDEN MINE
ANNUAL REPORT
YEAR 1936

15. POWER (CONT.)

furnish this property with power transmitted directly to the mine at 33,000 volts with a sub-station close to the Mine instead of having a long feeder line at 2300 volts which is often too small for the demands upon it. Inasmuch as the main transmission line runs within a mile of this property, the cost of having a sub-station installed should not prove excessive in view of the benefits that would be derived from it. While it is impossible to calculate the cost of these frequent small delays, there is no question in our minds that a considerable saving could be shown if this loss could be eliminated.

16. WATER SUPPLY

With the additional drain of the diamond drilling operations, it was found that the supply of water was inadequate. As soon as an independent source was found for the diamond drills, the normal supply was satisfactory for the routine operation of the mine. The water for the diamond drilling is now being procured from an old test pit.

18. NATIONALITY OF EMPLOYEES

	American Born	Foreign Born	Total
English	12	3	15
Swedish.....	7	1	8
Finnish.....	13	4	17
Irish.....	8	-	8
Norweigan.....	2	-	2
Total	42	8	50

ATHENS MINE
ANNUAL REPORT
YEAR 1936

1. GENERAL:

The Athens Mine operated on a three day schedule during the month of January, on a four day schedule from February 1st to May 4th, and from May 4th to the end of the year on a five day schedule. Two crews of men were employed until near the end of November when a small third crew started working. Detail statements of the operating schedules in effect during 1936 appear elsewhere in the report.

The outstanding events of the year at the Athens Mine were as follows: The increase in working schedules, the extensive repairs to the steel sets in the circular concrete shaft, piping city water into the mine, the decision to open the 7th level for mining, the completion of an airway raise in rock from the 10th to the 6th levels and the enclosing of the shafthouse with fire-proof material. The extensive program of development work undertaken in 1935 to open new territory for mining above the 6th level was completed late in 1936. The decision to open the 7th level was based on the necessity of providing additional working places as mining in block 3 on both the north and south sides of the fault dike--above the 6th level--are now close to the elevation of the level. The heavy production planned for 1937 cannot be obtained except by adding more miners and working a number of places on a three shift schedule.

Pumping costs were much lower in 1936 due to pumping at the Breitung Shaft of the Jones & Laughlin Steel Company which diverted much of the surface water from the cave to surface on the Athens property. Pumping at the Breitung Shaft was started in February 1935.

Shipments from stockpile were about the same as in 1935--169,153 tons as compared with 171,674 tons in 1935. The actual increase in shipments for the year was 76,854 tons or 29%. Production increased 118,354 tons or 61% in 1936 due to the increased working schedule.

Statements have been made in the last three annual reports of the bad effects of the two idle periods and the low operating schedules in effect since 1931. During 1936 repair costs continued much above normal due to the above causes. However, due to recribbing all the older raises on the 6th level and repairing practically all of the main level drifts, this level is at last nearly free of this extra expense. The 4th, 8th, 9th, and 10th levels, however, will continue to cost above normal for repairs as all of the rotted timber in the drifts have not yet been replaced.

Particular attention was given to safety of employees during 1936 in connection with development of the new mining areas above the 6th level and mining of the first or top sub-levels. It is gratifying to report that only one serious accident, a broken leg, occurred in the development of these areas during the year. Extra care was taken to build timber bulk heads around the tops of the long raises (230 feet in height) to insure the miners an outlet in case of sudden or unexpected crushing of the newly mined areas. Close poling and wiring of the floors of the new sub-levels was done to insure holding back the jasper mat which was blasted down in case it failed to come when the timber legs in the slices were blasted. During the year there were seven lost time accidents. In order to make all

ATHENS MINE
ANNUAL REPORT
YEAR 1936

1. GENERAL: (Cont'd)

employees more safety conscious, a plan was inaugurated in 1936 of giving a few cash prizes and a gift to each employee at the end of the year for good safety records. If an employee had no accidents he had twelve chances to win a cash prize at the drawing held on December 23rd, but for every lost time accident he lost one or more chances. Sixteen cash prizes from $50.00 down to $5.00 were awarded on December 23rd to various employees. Those failing to win a cash prize were given a lunch kit fitted with a thermos bottle. It is believed that the rewards offered made the men more careful in observing the safety rules and standards throughout the year and thus reduced the number of accidents.

The employment of additional men in November and December--most of whom had no previous experience in the mines--has increased the hazard; but with all the older hands safety conscious, the risk is less than in former years (1920 to 1930) when less emphasis was placed on safety.

The gift of a week's vacation with pay in August, 1936, and the decision to permit the men to make up the time lost by the week's vacation was greatly appreciated, as the lean years (1931 to 1936) left nearly all the employees badly in debt. More working time--together with the increase in wages effective November 16th--and the opportunity to get insurance under the Group Insurance Plan, has made the men realize that the Company was a real friend.

2. PRODUCTION, SHIPMENTS & INVENTORIES:

a. Production by Grades:

	1936	1935	Increase	Decrease
Athens Ore	167,860	123,842	44,018	
Mitchell Lease	143,028	68,692	74,336	
Total Ore	310,888	192,534	118,354	
Rock	7,871	13,326		5,455
Total Hoist	318,759	205,860	112,899	

b. Shipments:

Grade of Ore	Pocket Tons	Stockpile Tons	Total Tons	Total Last Year
Athens Ore	91,317	88,368	179,685	192,590
Mitchell Lease	78,224	80,785	159,009	69,250
Total	169,541	169,153	338,694	261,840
Total Last Year	90,166	171,674	261,840	
Increase	79,375		76,854	
Decrease		2,521		

Shipments increased 29.2% in 1936 and were 27,806 tons more than the product for the year.

ATHENS MINE
ANNUAL REPORT
YEAR 1936

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

c. Stockpile Inventories:

Grade of Ore	Dec. 31,1936	Dec. 31, 1935	Decrease
Athens Ore	38,879	50,704	11,825
Mitchell Lease	17,167	33,148	15,981
Total	56,046	83,852	27,806

d. Division of Product by Levels:

The ore hoisted from the various levels was as follows:

	1936		1935	
	Tons	%	Tons	%
4th Level				
6th Level	302,518	97.3	127,797	66.4
8th Level	8,370	2.7	64,737	33.6
9th Level				
Total	310,888		192,534	

e. Production by Months:

The production by months was as follows:

Month	Athens	Mitchell	Total	Rock
January	9,724	8,010	17,734	278
February	10,880	10,403	21,283	367
March	11,445	9,415	20,860	563
April	11,260	9,492	20,752	876
May	14,725	10,758	25,483	697
June	14,926	12,773	27,669	650
July	16,719	13,395	30,114	353
August	12,846	11,662	24,508	533
September	17,618	13,926	31,544	1578
October	17,605	16,046	33,651	712
November	13,074	12,718	25,792	813
December	17,038	14,430	31,468	451
Total	167,860	143,028	310,888	7871
Total 1935	123,842	68,692	192,534	13326
Increase	44,018	74,336	118,354	
Decrease				5455

f. Ore Statement:

	Athens	Mitchell	Total	Total 1935
On hand Jan. 1, 1936	50,704	33,148	83,852	153,158
Product for year	167,860	143,028	310,888	192,534
Total	218,564	176,176	394,740	345,692
Shipments	179,685	159,009	338,694	261,840
Balance on hand	38,879	17,167	56,046	83,852
Increase in Output	44,018	74,336	118,354	29,828
Dec. in Ore on Hand	11,825	15,981	27,806	69,306

g. Delays:

The mine was idle two shifts on May 15th, May 22nd, and May 29th on account of repairing the steel sets in the circular concrete shaft. The product lost was made up by working day shift on six Saturdays later in the year.

ATHENS MINE
ANNUAL REPORT
YEAR 1936

2. PRODUCTION, ETC.: (Cont'd)

h. Delays from lack of Current:

There were no delays from lack of current that affected production. Several times during the year the current was off for periods of thirty minutes or less.

3. ANALYSIS:

a. Average Mine Analysis on Output:

	1936				1935			
Grade	Tons	Iron	Phos.	Silica	Tons	Iron	Phos.	Silica
Athens	167,860	61.29	.146	6.33	123,842	61.44	.132	5.75
Mitchell Lease	143,028	61.30	.139	6.38	68,692	61.39	.132	5.98

b. Average Analysis on Straight Cargoes:

	Mine			Lake Erie	
Grade	Iron	Phos.	Silica	Iron	Moisture
Athens Mitchell Lease	61.70	.152	6.03	None	

c. High Sulphur Ore:

No high sulphur ore was encountered in mining or development work in 1936.

4. ESTIMATE OF ORE RESERVES:

a. Developed Ore:

Assumption: 12.75 cubic feet equals one ton
10% deducted for rock
10% deducted for loss in mining
Percentage of Bessemer equals 0%.

4th Level and above	946,809
4th " to 6th Level	1,871,580
6th " " 8th "	1,093,740
8th " " 9th "	403,015
9th " " 10th "	354,812
Below 10th Level	49,236
Total developed ore Dec. 31st, 1936.	4,719,192

The estimate a year ago was 4,505,486 tons; the increase in 1936 was 213,706 tons. Including the ore mined in 1936 the increase was 524,594 tons. This comparatively large increase was due to developing the ore body near the South footwall further to the West in Block 3--which materially increased that ore area. Heretofore in the absence of definite information this ore body was outlined much smaller in area to the West of #620 Crosscut on the 6th level. The increase in ore reserves is on Athens Iron Mining Company land to the west of Lot 8, Mitchell Lease.

b. Prospective Ore:

All ore in the mine is developed.

ATHENS MINE
ANNUAL REPORT
YEAR 1936

4. ESTIMATE OF ORE RESERVES:

c. Estimated Analysis:

Ore Reserves: Approximate Expected Natural Analysis:

Iron	Phos.	Silica	Mang.	Alum.	Lime	Mag.	Sul.	Igni.	Moist.
52.90	.121	5.60	.400	2.75	.80	.75	.011	1.40	13.00

Ore in Stock: Average Natural Analysis:

Tons	Iron	Phos.	Silica	Mang.	Alum.	Lime	Mag.	Sul.	Igni.	Moist.
56,046	54.11	.124	5.86	.400	2.77	.62	.73	.010	1.33	11.47

5. LABOR AND WAGES:

a. Comments:

(1) Labor:

There was no labor turnover in 1936. There was no change in the number of employees from January to September. From September 1st to December 31st there were a few additional men hired for underground work, most of whom were employed in November and December. There are many applicants for jobs, mainly by young untrained men who in a number of cases have never worked. Some of the applicants have had short periods of employment on F.E.R.A. and W.P.A. jobs. Able bodied sons of employees are given the preference. There is now a feeling of security and contentment among the employees which has been absent for many years.

(2) New Construction:

E. & A. No. 718 (Fireproofing Shaft House) was started in June and completed in November. All the work was done by Company employees. It will be described in detail under heading No. 12--New Construction, etc.

b. Comparative Statement of Wages And Product:

	1936	1935	Increase	Decrease
Product:	310,888	192,534	118,354	
No. Shifts-1-8 hr.)	113	1-8hr.303		190
and Hours -2-8 hr.)	180		180	
	Net Increase-170 Shifts			
Average No. Men Working:				
Surface	50	47	3	
Underground	171	166	5	
Total	221	213	8	
AVERAGE WAGES PER DAY:				
Surface	4.21	4.14	.07	
Underground	5.11	4.88	.23	
Total	4.89	4.70	.19	
AVERAGE WAGES PER MONTH:	(Based on Mine Payroll including Capt. & Clerks)			
Surface	91.17	70.29	20.88	
Underground	102.45	71.83	30.62	
Total	99.90	71.49	28.41	
PRODUCT PER MAN PER DAY:				
Surface	23.95	20.12	3.83	
Underground	7.56	6.56	1.00	
Total	5.74	4.95	.79	

ATHENS MINE
ANNUAL REPORT
YEAR 1936

5. LABOR AND WAGES: (Cont'd)

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

	1936	1935	Increase	Decrease
LABOR COST PER TON:				
Surface	.176	.206		.030
Underground	.676	.743		.067
Total	.852	.949		.097
AVERAGE PRODUCT MINING:				
Stoping	21.16	22.38		1.22
Ore Development	11.75	10.20	1.55	
Total	20.12	20.85		.73
AVERAGE WAGES CONT. LABOR:	5.81	5.80	.01	
TOTAL NUMBER OF DAYS:				
Surface	12,983¼	9,567½	3,415¾	
Underground	41,141½	29,342¼	11,799¼	
Total	54,124¾	38,909¾	15,215	
AMOUNT FOR LABOR:				
Surface	$54,700.44	$39,643.24	$15,057.20	
Underground	210,232.36	143,093.67	67,138.69	
Total	$264,932.80	$182,736.91	$82,195.89	
AVERAGE WAGES PER MONTH AS PER LABOR STATEMENT:				
LESS CAPTAIN AND CLERKS				
Surface	89.00	66.72	22.28	
Underground	101.58	70.91	30.67	
Total	98.86	70.03	28.83	

Six cents (6¢) per hour increase in wages effective Nov. 16, 1936.

Proportion of Surface to Underground Men:

1936:	1-3.42	1-8 hr. shift, 3 days per week, Jan. 1st to Feb. 1st. 1-8 hr. shift, 4 days per week, Feb. 1st to May 4th. 2-8 hr. shift, 5 days per week, May 4th to Dec. 31st.
1935:	1-3.53	1-8 hr. shift, 2 days per week, Jan. 1st to Feb. 11th. 1-8 hr. shift, 3 days per week, Feb. 11th to Dec. 31st.

ATHENS MINE
ANNUAL REPORT
YEAR 1936

5. LABOR AND WAGES: (Cont'd)

Operating Schedules 1936:

MONTH	Days Mine Worked Per Week	Days Per Mo.	Days Men Worked Per Week	Avg. Shifts Worked Per Mo. By Each Man	Size Crew	Remarks
January	6 da.	27	3 days	13½	1/2 Normal	
February	6 da. 2 nites	25	4 days	16½	1/2 "	
March	6 " 2 "	26	4 days	17½	1/2 "	
April	6 " 2 "	26	4 days	17½	1/2 "	
May	5 " 5 "	19	5 days	18	1/2 "	Mine idle 3 days (6 shifts) repair shaft.
June	5 " 5 "	22	5 days	21½	1/2 "	
July	5 " 5 "	25	5 days	24	1/2 "	Made up 2 shift lost in May.
August	5 " 5 "	26	5 days	18	1/2 "	Week's Vacation with pay for each crew
September	5 " 5 "	25	5 days	22½	1/2 "	Made up time lost on holidays by working on Saturday.
October	5 " 5 "	26	5 days	24	1/2 "	Made up time lost on vacations on Sat.
November	5 " 5 "	23	5 days	21	1/2 "	Made up time lost on holidays, Nov. 3 & 26, on Sat.
December	5 " 5 "	25	5 days	23	1/2 "	Made up time lost on Dec. 25 and night of Dec. 24th & 31 on Saturdays.

AVERAGE FOR YEAR: 24 7/12 days per month worked by mine
19 3/4 shifts per month worked by men

ATHENS MINE
ANNUAL REPORT
YEAR 1936

6. SURFACE:

a-1. Buildings, Repairs:

A contract was let for repair of the engine house roof. This work was started in August and completed in September at a cost of $723.52. Efforts had been made to repair the old roof for several years, but the leaks could not be eliminated by application of a primer coat and seal compound. A new roof was laid on top of the old roof of the engine house.

A room 10' x 16' in size was partitioned off the east change room in the dry house for storage and charging of the Edison Cap Lamps which replaced the carbide lamps in June. The wooden frame walls of the lamp room were covered with wire lath and plastered with cement to make them fireproof.

An inside stairway was constructed from the west change room in the dry to the boiler room thirteen feet below and adjoining on the west. Necessary ground was excavated below the floor of the dry from a hole cut through the foundation wall, the space for the stairs walled by concrete and concrete stairs with pipe hand rail built. The top of the stairway is enclosed with pipe railing and gate. The above improvement was made for the dryman who also takes care of the heating plant. Heretofore he had to walk about one hundred feet out of doors to get from the dry to the boiler house. The dry house is very warm and the dry man often caught severe colds from the exposure. In the summer the old hot water pipes in the dry, from the hot water heaters to the showers, were replaced with copper pipe.

a-2. Docks, Trestles, and Pockets:

The coal trestle was overhauled in the spring, several rotted legs being replaced.

A portion of the wood stocking trestle erected in 1931 between the two steel trestles was dismantled in the summer. Considerable of the trestle timber was salvaged and sold to other mines. The legs in the ore pile have rotted so that the entire trestle will have to be rebuilt if it should ever be needed for stocking again.

Necessary repairs were made to the storage pockets in the shaft house prior to the opening of the shipping season. A number of lining plates were replaced.

Some expense was incurred during the year on the rock trestle. The tracks are laid on the rock pile and careful blocking is necessary to avoid accidents to the side dumping car.

a-3. Scrap Iron:

All scrap iron at the mine was sold in the summer. The old boiler used for storage of Zinc Chloride solution prior to remodeling the treating plant was cut up by the purchaser and included in the scrap.

ATHENS MINE
ANNUAL REPORT
YEAR 1936

6. SURFACE: (Cont'd)

a-4. City Water Line Extension to Shaft:

In the summer it was decided to pipe city water into the mine to provide a supply for drinking, for rock drill machines, water sprays to settle the dust in rock work and also to provide a supply under good pressure for spraying the dry raises. The nearest city water line was about eighty feet from the shaft. A 1-1/4" line was extended to the concrete shaft at a depth of seven feet below surface. The railroad tracks had to be crossed at an angle through the rock fill. This proved quite difficult as the tracks were in constant use. Entry to the skip road in the shaft was made near the timber tunnel.

a-5. Addition to Timber Tunnel:

While the excavation for the water line was open, a room four feet square, adjacent to the concrete shaft, was concreted and later a door cut through to the timber tunnel. This small room provides a place for the loader at the shaft to get out of the heavy draft of air in the tunnel. The cage road is the downcast for the air and in the winter the tunnel is very cold. The mine telephone is located in the new room.

a-6. Fireproof Enclosure Steel Shaft House:

On account of the fire at the Negaunee Mine shaft house in February, 1936, it was decided to dismantle the wooden enclosure above the shaft house landing and install a fireproof enclosure. The wooden structure was dismantled in June and fabrication of the steel structure started. A crew of three company men were employed on this work which was carried on while the mine was operating. It was completed in November. The necessary steel framework to carry the Ferrobord steel sheeting was installed and then the Ferrobord put on. The skip roads above the landing were enclosed by 1/4" steel plate. The top tram engine house was relocated and the new one built entirely of steel and concrete. All the work was completed except painting the exterior which will be done in 1937. The cost of this work was $3831.01; it was covered by E. & A. #718.

a-7. Rewiring Shop Building:

The electrical wiring in the shops did not comply with the National Electric Code, and the building was rewired in the summer. The lights were re-arranged to provide for better lighting. All wires are now in conduit, and the lighting is modern.

b. Stockpiles:

In 1936 practically all the ore under the southeast stocking trestle was loaded and shipped. This cleaned up the Athens ore that was stocked last winter from this trestle. Shipment of Mitchell Lease ore that was stocked last year from the northeast steel trestle was then started, and most of this ore was removed before the close of the shipping season. It is planned to stock Athens ore this winter from the southeast steel trestle and Mitchell Lease ore from the northeast steel trestle the same as last year.

ATHENS MINE
ANNUAL REPORT
YEAR 1936

6. SURFACE: (Cont'd)

c. Timber Treating Plant:

As early as possible in the spring peeling of timber was started for treatment after drying. The treating plant went into operation for a short time the last of June and early in July. Zinc chloride was used for treatment of this timber. Peeling continued during July, August, and the early part of September when treatment was resumed and continued until all the timber that had been prepared had been treated. Just prior to resuming operations at the plant in September the old zinc chloride solution was pumped out of the tanks, the tanks thoroughly cleaned and a new solution put in. The new solution is known as Chromated Zinc Chloride and is claimed by the manufacturers, the Grasselli Chemical Co., to be more efficient in penetration and preserving qualities than the zinc chloride formerly used. The old solution was pumped out into two steel tanks that had been used many years ago as treatment tanks. A small percentage was later pumped back into the treatment tanks. The Grasselli Chemical Co. stated that a small amount of the old solution would not effect the chromated solution. In the next several years it is planned to use all of the old solution. When treatment was finished early in October, peeling of the timber on hand continued, and three hundred and ninety-four pieces were decked for drying over the winter and will be treated early in the summer of 1937. This year larger sized timber was peeled and treated. Treatment makes timber more brittle and unable to withstand as much pressure as ordinary green timber, and it was, therefore, considered advisable to increase the size of the timber to decrease the breakage in the mine. The cost for peeling and treatment increased in 1936 due to the use of this larger size timber.

It will be at least seven or eight years before data will be available on the added life of timber treated with Chromated Zinc Chloride instead of zinc chloride. The ordinary life of timber treated with zinc chloride is from six to ten years, and it is claimed that the Chromated Zinc Chloride solution will add from one to two years to the life of the timber

Maintenance cost of the timber treatment plant was higher in 1936 due to making new covers for the treatment tanks and repairing the steel lining of the tanks above the solution line which is maintained about eighteen inches below the top of the tanks when there is no timber in the tanks for treatment. When treatment of timber is underway, the solution rises to within six inches of the top of the steel linings. The portion of the steel lining which is thus intermittently exposed to the air deteriorated under the action of the zinc chloride. The Grasselli Chemical Co., in answer to an inquiry, stated that the Chromated Zinc Chloride would not have any effect on the steel lining of the tanks. There was also a new wire rope put on the derrick used in handling timber in and out of the tanks and some expense incurred for cleaning the tanks when the solution was changed.

ATHENS MINE
ANNUAL REPORT
YEAR 1936

6. SURFACE: (Cont'd)

c. Timber Treating Plant: (Cont'd)

	Cost Per Ft. 1936	Cost Per Ft. 1935	Cost Per Ft. 1934
Peeling	.0398	.0254	.0287
Treating	.0383	.0326	.0211
Decking	.0060	.0018	.0133
Zinc Chloride	.0094	.0157	.0212
Chromated Zinc Chloride	.0240		
Heat, Water, etc.	.0118	.0096	.0091
Total	.1293	.0851	.0934
Maint. Cost	.0069	.0030	.000
Grand Total	.1362	.0881	.0934

The grand total cost of treated timber in 1936 was almost five cents per foot higher than the previous year and four cents higher than in 1934. The peeling cost increased on account of larger timber; the cost of treating increased on account of less pieces handled per day on account of the larger sized timber. There was also more expense for decking the timber--for drying due to the larger sizes. Additional expense was incurred on account of changing the solution from zinc chloride to Chromated Zinc Chloride. It was necessary at the start to make a full strength solution in both tanks whereas in previous years with the zinc chloride solution it was only necessary to add a small quantity to the old solution to bring it up to the required strength. Maintenance cost was also higher in 1936 than in previous years as some repairs were necessary for the first time since revamping the plant a few years ago.

Year	No. of Pcs. Hardwood Stull Tbr. Treated	No. of Ft. Treated
1936	1523	13,233
1935	1931	15,966

	1936	1935
No. of Pcs. Used at Athens	1255	759
No. of Pcs. Shipped to Maas & Neg. Mines	444	972
Total Pcs. Used and Shipped	1699	1731

	Treated Tbr. On Hand 12/31/36.		Peeled Untreated Tbr. On Hand 12/31/36.
9 ft.	356		161
8 ft.	462		233
Total	818		394
On Hand 12/31/35	980		None
Decrease	162	Increase	394

ATHENS MINE
ANNUAL REPORT
YEAR 1936

6. SURFACE: (Cont'd)

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

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

	1936		1935		1934	
	Gals.	Am't	Gals.	Am't	Gals	Am't
1st Quarter	288,000	$26.69	193,000	$19.14	297,000	$27.85
2nd "	603,000	51.78	318,000	30.84	294,000	28.28
3rd "	879,000	71.45	679,000	55.99	303,000	30.57
4th "	541,000	45.43	380,000	33.97	274,000	26.86
Total	2,311,000	195.35	1,570,000	139.94	1168,000	113.56
Product	310,888		192,534		162,706	
Cost Per Ton	.000628		.00073		.00070	

The amount of water consumed shows an increase in all quarters of the year due to the heavier operating schedule. The cost per ton shows a decrease compared to the two previous years due to the larger production. The amount of water consumed does not increase proportionately to the increased operating schedule and larger production.

e. Grounds:

The grounds around the mine buildings were kept in good condition in 1936. An application of fertilizer was given the lawns and shrubbery for the first time in several years as it had been omitted during the depression. The row of Lombardy poplars on the west side of the grounds near the entrance from Ann Street were cut back to a height of about eighteen feet. They had grown so tall that they were a menace to the road-way as well as the mine office, laboratory, and crusher buildings. During the balance of the summer they made a strong bushy growth and are now more attractive in appearance than formerly.

7. UNDERGROUND:

a. Shaft Sinking:

There was no shaft sinking in 1936.

b. Development:

(1) General

There was an unusual amount of development work underway during the past year mainly on and above the 6th level. In addition to completing the development of the west half (150 ft.) of block four on Mitchell Lease-- lots Eight and Nine in the area near the South foot wall; this block was opened for mining by three raises in the area immediately south of the fault dike. The ore body north of the fault dike in the west half of block four was also developed by one raise and a transfer drift and two raises on the 450' sub-level elevation. The latter ore body is cut off by the fault dike intersecting the footwall at the elevation of the -335' sub-level or sixty-two feet above the 4th level elevation. A development drift was driven in block 3 to the west from #620 cross-cut and three raises completed to the hanging. Late in December opening of the 7th level was started. This level was partly opened at the shaft nearly twenty years ago. The decision to open the 7th level instead of driving cross-cuts and raising from the 8th to 6th levels was based on several factors, to wit: less rock drifting and raising (approximately 1000 feet), less repairing raises, practical elimination of blocking of ore in raises, better

ATHENS MINE
ANNUAL REPORT
YEAR 1936

7. UNDERGROUND:

b. Development:

(1) General:

ventilation control and increased safety. Work was started on development of the 7th level in December.

The development of the west half of block 4 on Mitchell Lease lots Eight and Nine was started in 1935 and completed early in 1936. This year two branch raises, No. 616 -A and No. 612-A, were completed from the 485' sub-level to the hanging No. 616-A at a height of 110 feet and No. 612-A at a height of 85 feet. Two raises, Nos. 615 and 616 in 610 cross-cut, uncompleted in 1935, were finished early in 1936 at heights of 224 and 230 feet respectively.

There was 70' of ore drifting on the 485' intermediate sub-level, 325' ore drift on the 510' intermediate sub-level and 155' of ore drift on the 550' ventilation airway sub-level. These drifts provided airways and traveling road connections between the three ore bodies opened for mining in 1936 in the west half of block 4, and also a connection to the main exhaust airway from the 6th to the 4th levels. There was also 164 feet of rock and ore drifting in connection with the development of the ore body north of the fault dike on the west half of Block 4.

6th Level:

Development work in #610 cross-cut started in 1935, and was not finished at the end of the year. The following table gives complete information for the raises that were put up in the cross-cut in 1936.

Raise No.	Total Height		Material
615	224'	Paint rock	0-110'
		Ore	98'
		Lean Ore	16'
616	230'	Paint rock	100'
		Ore	130'

In 1935, #615 raise had been extended 66feet in paint rock and #616, 85 feet in paint rock.

During the year three raises were put up on the 6th level in the main east-west drift to mine the small ore body directly south of the fault dike. All were double compartment raises and the following table records the height and material encountered:

Raise No.	Total Height		Material
617	167'	Ore	0-163'
		Jasper	163'-167'
618	162'	Ore	0-159'
		Jasper	159-162'
619	158'	Ore	0-154'
		Jasper	154-158'

ATHENS MINE
ANNUAL REPORT
YEAR 1936

7. UNDERGROUND: (Cont'd)

b. Development: (Cont'd)

6th Level: (Cont'd)

In the main east-west haulage drift on the north side of the fault dike one raise was put up to the 450' sub-level where a transfer drift was driven and two raises extended to the top of the small ore body on the north side of the fault dike. Following is a record of this double compartment raise:

#670 raise 170' total height Ore 0-170'

In order to develop the westward pitching ore body near the south footwall in block 3, it was decided to drive a drift parallel with and ninety feet south of the main haulage drift on the south side of the fault dike. This drift was turned off from #620 cross-cut and extended 195' more to the west. After completing the drift, three raises were put up to the jasper hanging; the record of these raises is given in the following table:

Raise No.	Total Height		Material
660	122'	Ore	0-122'
661	89'	Ore	0- 79'
		Jasper	79'-89'
662	62	Ore	0-62'

In addition to the large amount of repair work which was necessary in the various raises on the 6th level, there was an extraordinary amount of re-timbering of the main level drifts. The timber in large sections of these drifts had been driven down into the floor of the level by pressure so far that there was not sufficient clearance for proper loading of the haulage cars. The timber was replaced and sufficient ground removed for installation of 9 foot legs and caps. This work could only be carried on when the mine was idle and in order to make head-way large crews of men were employed on this work on the idle days. Crushing of the drift on the north side of the fault dike was quite severe during the year due to mining operations in this area approaching the main level. Crews of men worked here every week-end throughout the year repairing the broken timber. Repairs have been very heavy in the long raises in #620 and #610 cross-cuts. In a few months three inch hardwood lining plank in these raises is completely cut out and has to be replaced. In some of the raises the cribbing rotted and started coming out and had to be replaced. Due to the heavy program of repair work underway throughout the year the 6th level was in a fairly good state of repair at the end of the year.

The air-way raise in rock from the 8th to the 6th level holed to the 6th level at a point 75 feet north of the main east-west haulage drift on the north side of the dike. A small pilot drift about 6' x 6' in size was driven to connect with the 6th level after which the small drift was stripped to 9' x 9' in size and later gunited to prevent slabbing of the ground due to the action of air.

ATHENS MINE
ANNUAL REPORT
YEAR 1936

7. UNDERGROUND:

b. Development:

7th Level:

There was no work done on this level in 1936 other than cleaning up the small drift that was opened many years ago from the cage compartment of the shaft about 80 feet to the South from which point it was driven back to the northwest and holed to the transfer raises at the shaft. The drifts at the shaft were cleaned for extending this level to the ore body and thus make it into an operating level. In the ore body there were two air raises from the 8th to the 6th level, one of which was badly crushed. The other happened to be located on the line planned for the 7th level east-west haulage drift in ore on the south side of the fault dike. It was decided to plank one compartment of this old air raise and use it for transfer of the ore that would come from driving the ore drift on the 7th level. The last of December, after planking this raise, the work of cutting out at the elevation of the 7th level was started. The new 7th level will be developed both from the shaft end and also in the ore body. The ore drift and the rock drift from the shaft will later intersect. In preparation for handling the rock that will come from the development of the 7th level, it is planned to put up a rock raise about 50 feet south of the transfer raises at the shaft which will be used for storage of rock. This raise will be in hard ground and will hold about 50 cars of rock which will be hoisted from the 8th level after transferring it from motor cars to the 8th level pocket. The present drift on the 7th level plat will will have to be stripped to make it higher and also wider to provide for motor haulage. Part of this work must be done prior to starting the rock drift to the ore body in order to make room for the equipment that will be used in the drift.

8th Level:

Mining was underway above this level in block 2 during January and February of 1936. On completion of mining on the sub-levels, the main level drifts were propped as it was desirable to keep them open as long as possible. No further work was done here until late in the year when repairing of the main haulage drift in block 3 was started. This work was done in anticipation of raising from the 8th to 6th levels in this block to prepare for mining the ore body just above the 6th level on the north and south sides of the dike. The sets on the 8th level were partially rotted and pushed down into the floor so that there was not sufficient height for fully loaded tram cars. This work was started in the haulage road east of #810 cross-cut.This cross-cut extends to the south and the two ventilation raises in ore are located here. At the time the decision was made to open the 7th level in order to divide the 200 feet distance between the 6th and 8th levels into 100 feet intervals, this repair work had been practically completed and the men were then transferred to #810 cross-cut. New sets were placed in No. 814 ventilation raise and also mid-way between No. 814 and No. 811 raises where it is planned to put up a new raise. On completion of the necessary repairs to the cross-cut, planking of No. 814 raise was started in anticipation of cutting out this raise at the elevation of the 7th level.

ATHENS MINE
ANNUAL REPORT
YEAR 1936

7. UNDERGROUND: (Cont'd)

b. Development: (Cont'd)

8th Level:

In addition to this work practically all of which was done in connection with the opening of the 7th level; the 8th level haulage drift in the vicinity of the new ventilation raise in rock was gunited and all loose rock from raising operations cleaned up.

9th Level:

Aside from repair of the main level haulage drift from the shaft to the ore body, the only work done on the 9th level in the past year was in connection with the ventilation raise in rock from the 10th to the 6th levels. The ground in the drift near the rock raise from the 10th level was quite loose and in order to make a permanent job, it was decided to seal the rock off from the air with a 6" concrete wall in the area adjacent to the top of the raise. This work was done during the summer. It will last for the life of the mine.

10th Level:

The only work done in 1936 on the 10th level was in connection with the ventilation raises in rock. Originally the second raise from the 10th to the 9th, put up in 1935 was merely a pilot raise about 4 feet in diameter. This was stripped to full size, 6' x 8', in the fall of 1936. Some water came through the ground near the 9th level, and after stripping the raise to full size, a ridge was cut around the raise about 12 feet below the 9th level, and the water sealed off in this section with a 6" concrete wall. This work proved successful in cutting off the water which would have interferred with guniting the foot of the raise all the way to the 1pth level. After thorough barring it was gunited from the 9th down to the 10th level with two heavy coats of gunite. The main drift from the shaft to the ore body on the 10th level was kept in repair during the year. All sets that broke down were replaced as well as some of the ones which were badly rotted. There is still an air-way raise in ore partly open between the 10th and 9th levels, but the main volume of air reaches the 9th through the two rock raises.

c. Stoping:

(1) General Remarks:

In 1935 mining was confined to block 3 on the 6th level and 8th level. Raising was underway preliminary to mining in the west half of block 4 on Mitchell Lease, lots 8 and 9. In 1936 development of the west half of block 4 was completed in the area near the south footwall and mining started on the 4th level elevation. Later in the year it was decided to develop the ore body south of the fault dike and the small ore body on the north side of the fault dike, both these areas being in the west half of block 4.

These three ore bodies in block 4 extend from the south footwall to the main dike which forms the northern boundary of the ore body. Development of the two small ore bodies, one on each side of the fault dike, was completed before the end of the year and mining started.

ATHENS MINE
ANNUAL REPORT
YEAR 1936

7. UNDERGROUND:

c. Stoping:

(1) General Remarks

In January 1936, mining on the 8th level in block 3 was completed after the subs had reached a point only a short distance above the 8th level and the balance of ore in this area will be mined later by raises from the 9th level.

The increase in the working schedule from three days to four days and later to five days with two crews of men greatly accelerated the rate of mining. For the first time in many years several sub-levels in each area were mined out during the year. Mining on the north side of the fault dike in block 3 progressed from the 530' sub-level to the 550' sub-level which was 60% mined at the end of the year. In this area 2-1/2 sub-levels were mined in 1936. On the south side of the fault dike mining was underway on the east half of the 515' sub-level in January 1936, and one-fourth of the 540' sub-level was mined out by the end of the year. Mining in this area, therefore, was finished during the year on the 515', the 530', and well advanced on the 540' sub-level. Near the south footwall where mining was started early in 1935 under the hanging near the 4th level elevation; mining wasnearly finished on the 460' sub-level at the end of 1935. Development of the 470' sub-level in this area started late in 1935 and this sub-level was completely mined in 1936. The 485' sub-level in this area was developed and was about 90% mined at the end of the year. Development of the 500' sub-level in this area was started in November, 1936, and most of the raises connected by the end of the year. In this area two sub-levels were mined during 1936. All the above work was in block 3.

Late in 1935 a cross-cut was driven on the 6th level and raises started to develop the west half of block 4. The area to be mined from this development was the upper extension along the south footwall of the ore body which was opened for mining in Block 3 in 1935. It connects with an area mined nine years ago down to the elevation of the first sub-level above the 4th level in block 4. Mining was started in this new area at the 4th level elevation in the summer and by the end of the year the top sub-level, partly under the old workings and partly under new hanging, was mined and development of the second sub-level underway.

During the past several years experiments have been underway at the Negaunee Mine to determine the most economical way to carry on mechanized mining. It was found that efficiency was increased by long radial slices which required wider spacing of contracts and more working places. Accordingly it was decided to develop the small ore bodies in the west half of block 4 on the north and south sides of the main fault dike. These two areas would provide places for a few contracts to work efficiently.

All the year mining has been underway in block 3 and also in the latter portion of the year in the west half of block 4. Stoping operations in new areas opened under old rotted coverings or under new hanging required close poling and wiring to hold back the broken jasper, which--fortunately at the Athens breaks as soon as the ore is removed. To

ATHENS MINE
ANNUAL REPORT
YEAR 1936

7. UNDERGROUND: (Cont'd)

c. Stoping: (Cont'd)

(1) General Remarks:

insure a good mat, so that there will be no dilution of ore on the lower sub-levels, special attention was given to covering down on all the areas mined during the past year in the west half of block 4.

(2) Detail of Stoping:

To make the report on stoping clearer and more easily followed, each area mined is reported separately. Heretofore, the detail started with the highest sub-level where mining was underway and a description was given of mining on thatsub-level without particular reference to the area that was being mined.

NORTH SIDE OF FAULT DIKE IN THE WEST HALF OF BLOCK 4

To avoid excessively long raises that would be partly in rock, it was decided to develop this ore body by putting up one raise from the 6th to the 450' sub-level elevation, approximately 60 feet below the 4th level. A transfer drift was driven 130 feet to the northeast on this sub-level, and two raises extended to the 4th level elevation. Exploration on the 4th level indicated the ore body extended above this elevation and accordingly one of the transfer raises was put up a distance of about 21' above the 4th level to the 375' sub-level elevation. A cross-cut showed the ore body to be very small at this elevation, about 40' x 25' in size. An exploratory raise was put up from the side of this drift to the hanging at the elevation of the 335' sub-level, approximately 62 feet above the 4th level. Here the ore body pinched out with jasper on all sides. It was shaped like a cone with a base 25' across. The jasper was unusually hard and it was decided to stope the upper part of the ore body and later to start top slicing. The ore was mined in an open stope down to the 365' sub-level at which point it had increased in size to 25' x 25'. Slicing was then started on the 375' sub-level and at the end of the year the ore had been mined to the 4th level elevation where it was approximately 70 feet in length with an average width of 30 feet. Only one contract worked here as the area is not large enough as yet for two. This ore body is gradually increasing in size. Thus far, mining costs have been above normal due to the short slices. As mining progresses to lower elevations it is expected the ore body will increase in size and the output and cost per ton will compare favorably with other areas in the mine.

SOUTH SIDE OF FAULT DIKE IN THE WEST HALF OF BLOCK 4

Three raises were put up from the 6th level to mine this area, jasper being encountered in all three approximately 145 feet above the 6th level at the elevation of the 450' sub-level. In developing this ore under the jasper hanging it was found that in a small area at the east end of the block that the ore extended above the sub-level elevation. One transfer raise was put up here to the jasper at the elevation of the 440' sub-level and the ore mined. It was 40 feet long with an average width of 15 feet on the 440' sub-level. The 450' sub-level was then mined. Due to irregularities in jasper hanging, the ore area at this elevation was considerably restricted. Late in the year development of the third or 460' sub-level was started in this area. At the end of the year the two contracts

ATHENS MINE
ANNUAL REPORT
YEAR 1936

7. UNDERGROUND: (Cont'd)

c. Stoping: (Cont'd)

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

working here had connected the three raises and started slicing, one at east limit of the block and the other at the west. This ore body, as well as the one on the north side of the fault dike, is still quite small in area, and it is impossible to obtain good results as regards cost per ton until the ore area has become large enough to mine by longer slices from the raises.

SOUTH FOOTWALL IN THE WEST HALF OF BLOCK 4

Development of this area was started by driving a new cross-cut on the 6th level in 1935 and putting up five raises. The raises at the north end of the area encountered the hanging at much lower elevations than the three near the South footwall. The most northerly extended to the elevation of the 485' sub-level and the two most southerly ones to the elevation of the 395' sub-level, which is the first sub above the 4th level elevation. Mining was started in the summer by four contracts at the elevation of the 4th level. The East half of the sub-level was under an area mined a number of years ago, and the west was under new hanging. At a point near the South foot wall the ore connected with a small riser in the hanging that was mined in 1935 in block 3. The area of the ore body at the elevation of the 4th level is approximately 140' in width by 200' in length. This is the largest ore area where mining has been underway for a good many years at the Athens Mine. Long slices from the raises are possible here, a number of which vary from 90' to 120' in length. When a good mat is obtained, mining operations here will be under quite favorable conditions and should help to increase the tons per man per day for the entire mine.

The center raise, #612, put up from 610 cross-cut on the 6th level encountered the hanging at the 415' sub-level elevation or two subs below the 4th level. The ore here was mined by one contract; work was then temporarily stopped until mining of the area further to the south had reached this same elevation. The ore body here was approximately 100 feet in length with an average width of 30 feet.

SOUTH FOOTWALL ABOVE THE 6TH LEVEL IN BLOCK 3

In 1935 this area was mined from the 4th level to the 460' sub-level which was about 80% mined at the end of the year. In January 1936 mining was underway from four raises in the south side of the area on the 460' sub-level and from two raises at the north end of the area on the next lower or 470' sub-level. During the year mining was completed on the 460' sub, 470' sub, and 95% finished on the 485' sub-level where the last pillars in the north area were being mined at the end of the year. The south part of the area was being developed for mining on the 500' sub in November and December 1936. This is the lowest sub-level yet opened in this ore body and shows a gratifying increase in the length of the ore body along the South footwall. The jasper hanging has flattened at the west side of this area along the South footwall as the sub-level has extended nearly 90 feet farther west than the sub above. This extension of the ore body is however, only about 30 feet wide in the widest part. The main ore body has been developed by seven raises on the east side of # 620 cross-cut, two raises on the west side of this cross-cut and one from #660 drift making a total of ten raises. For economical mining, not more than six gangs should work in

ATHENS MINE
ANNUAL REPORT
YEAR 1936

7. UNDERGROUND: (Cont'd)

c. Stoping: (Cont'd)

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

SOUTH FOOTWALL ABOVE THE 6TH LEVEL IN BLOCK 3 (Cont'd)

this area--at the present time there are eight. This condition will be remedied as soon as additional areas are developed for mining in 1937.

NORTH SIDE OF FAULT DIKE IN BLOCK 3

The first of the year the raises at the elevation of the 540' sub-level had been connected by drifts and slicing started from the two most westerly raises. This ore body is approximately 325 feet in length with an average width of 95 feet, the raises being located approximately in the center. There are five raises about equally spaced in this area. The first of the year four gangs mined here. At the end of the year the gangs working here had been reduced to two. Mining is carried on from alternate raises and slicing, as far as possible, done in a longitudinal direction from every other raise. This permits a number of the slices to be twice the length that would be possible if every raise was used. During the year mining was finished on 540' and about 70% completed on the 550' sub-level. The 550' sub-level is 52 feet above the back of the 6th level. Only one more sub-level can be mined in this area from the 6th level, the balance of the ore above the 6th level, will be mined from the 7th level development of which level was started late in December. The number of contracts working in this area has purposely been decreased, both for increased efficiency and for the purpose of preventing too rapid extraction of the ore which would have resulted in cessation of mining here due to crushing the 6th level haulage drift prior to the development of this ore body for mining from the 7th level.

SOUTH SIDE OF FAULT DIKE IN BLOCK 3

In January 1936 mining was underway in the east half of this area from three raises on the 515' sub-level elevation. During the year mining of this sub-level and the 530' sub-level was completed while the raises had been connected and slicing started on the 540' sub-level. Mining on this side of the fault dike is one sub above the area being mined on the north side so that this area can be expected to last at least another year with three gangs mining. It is developed by six raises and is 320 feet in length with an average width of 85 feet. Mining, as far as possible, is done from three of the six raises so as to permit of longer slices. This arrangement also permits more storage room for timber supplies on the sub than would be the case if contracts were mining from each raise.

AREA ABOVE 8TH LEVEL BLOCK 3

At the end of 1935 there were only two contracts working on the subs above the 8th level. One contract was finishing the mining of the small ore body south of the fault dike near the south footwall at the elevation of the 760' sub-level, thirty-three feet above the floor of the 8th level. Mining was completed here in January with the removal of a few pillars near #835 raise. North of the fault dike mining of the last pillars around two raises was under way in January 1936, and mining was completed here by one contract in March and the other early in April. The sub mined here was only 22 feet above the floor of the 8th level. The balance of ore in block 3 above the 8th level will later be mined from the 9th level.

ATHENS MINE
ANNUAL REPORT
YEAR 1936

7. UNDERGROUND:

d. Timbering:

The cost per ton for timber was slightly lower than in 1935 and very nearly the same as in 1931. The serious effects of the shut downs and low operating schedules in effect until this year increased the timbering cost in 1936. Due to variation in prices paid for stull timber from year to year, the average price per foot in 1936 was 4.6% higher than in 1935. There was slightly less feet of timber and less lagging used per ton of ore. Seven percent of the timber used in both 1936 and 1935 was treated. The treated timber was used on the main levels where pressure was not heavy and on the intermediate sub levels that have been opened for ventilation and traveling roads between the 6th and 4th levels. The cost per ton increased in 1936 due to more cribbing timber used than in the previous year. The ore obtained from raising per foot of timber used is much below the amount from stoping per foot of timber, and the timbering cost always increases in a year with a heavy raising program. The timber purchased in 1936 was of high quality; the stulls were all sound, green hardwood, with a small percentage of green, sound hemlock.

	Linear Feet	Avg. Price Per Foot	Amount 1936	Amount 1935
6" to 8" Cribbing	168,565	.0329	5549.34	3835.64
8" to 10" Stulls	15,106	.0565	854.07	935.82
10" to 12" "	71,113	.0787	5593.71	3943.16
12" to 14" "	35,781	.1170	4185.32	2481.10
14" to 16" "	5,147	.1476	760.01	154.81
Treated Timber	10,368	.2315	2400.19	1332.53
Total 1936	306,080	.0632	19342.64	
Total 1935	209,063	.0604		12633.06
Lagging - 7 ft.	855,818	.6823	5839.39	4062.49
Poles - 9½ ft.	802,800	1.2801	10276.74	5889.56
Total 1936	1,658,618	.9717	16116.13	
Total 1935	1,085,256	.9170		9952.05
Wire Fencing - rods	495		261.00	
Grand Total - 1936			35719.77	
Grand Total - 1935				22585.11
Product			310,888	192,534
Feet of Timber Per Ton of Ore			.9845	1.0858
" " Lagging " " " "			2.7528	3.010
" " Poles " " " "			2.5823	2.6267
" " Lagging Per Foot of Timber			2.7961	2.772
Cost Per Ton For Timber			.0622	.0656
" " " " Lagging			.0188	.0211
" " " " Poles			.0331	.0306
" " " " Wire Fencing			.0008	-
Total Cost Per Ton			.1149	.1173
Equivalent of Stull Timber to Board Measure			608,310	427,137
Feet of Board Measure Per Ton of Ore			1.9567	2.2185

ATHENS MINE
ANNUAL REPORT
YEAR 1936

7. UNDERGROUND:

d. Timbering:

Total Cost of Timber, Lagging, Poles, etc.

Year	Amount	Cost Per Ton
1936	35,719.77	.1149
1935	22,585.11	.1173
1934	19,546.06	.1201
1933	11,372.50	.2401
1932	11,794.89	.1541
1931	28,704.68	.1141
1930	38,001.66	.0985
1929	34,833.71	.1015
1928	29,160.74	.1207
1927	23,288.37	.1001

e. Drifting and Raising:

The following statement gives comparative figures of footage of raising and drifting for the years 1936 and 1935:

	Drifting			Raising			
Year	Ore	Rock	Total	Ore	Rock	Total	Grand Total
1936	957'	198'	1155'	1533'	721'	2254'	3409'
1935	605'	288'	893'	713'	442'	1155'	2048'
Increase	352'		262'	820'	279'	1099'	1361'
Decrease		90'					

Remarks:

Drifting increased 29.3% and raising 95.1% in 1936. The increase in drifting and raising combined for the year was 66.4%. The increase was due to opening the west half of block 4 for mining on the south and north sides of the fault dike in addition to which the development of the same ore body above #610 cross-cut on the 6th level was completed in the early part of 1936. The completion of an air-way raise in rock from the 10th to 6th levels accounted for a small part of the development footage in 1936. The grand total of 3409 feet is much above normal for this mine, the cost per ton of $.072 was, however, less than in 1935, when the total was 2048 feet and the cost per ton .076.

f. Explosives, Drilling and Blasting:

The pounds of powder used per ton of ore increased 4.3% in 1936 while the cost of powder decreased 5.4%, so that the actual cost per ton for powder was approximately 1.2% lower. The increase of one foot in length of fuse, from 6' to 7' increased the cost for fuse approximately 17%, resulting in a net increase in cost for all explosives of 2% or $.0012 per ton of ore. The increase in cost per ton for all explosives was, therefore, due to adoption of a safety rule to decrease the danger of a premature blast while lighting the fuses. Figured in dollars and cents the cost of the added safety in blasting was approximately $528.50 for the year 1936. The cost for all explosives was the third lowest in the history of the mine, the lowest being in 1934, and the next lowest in 1935.

Tamping bags were used during 1936 in all blasting.

ATHENS MINE
ANNUAL REPORT
YEAR 1936

7. UNDERGROUND: (Cont'd)

f. Explosives, Drilling and Blasting: (Cont'd)

Statement of Explosives Used: (Ore Development and Stoping)

		Quantity	Average Price	Amount 1936	Amount 1935
50% Amonia Gelatin Powder	Lbs.	116,200	11.06	12,853.38	
60% " " "	"	1,150	11.80	135.75	
Total Powder 1936		117,350	11.07	12,989.13	
Total Powder 1935		69,650	11.71		8,154.15
Fuse	Ft.	446,440	5.67	2,530.85	1,412.04
Caps	Ea.	66,500	11.19	744.14	472.38
Tamping Bags		21,300	2.25	47.98	2.50
Fuse Lighters		9,000	7.05	63.44	33.75
Connecting Wire		10	.40	4.00	16.80
Electric Caps & Delays		2,600	10.91	283.75	
Total Fuse, Caps, Etc.				3,674.16	1,937.47
Total All Explosives				16,663.29	10,091.62
Product				310,888	192,534
Pounds Powder Per Ton of Ore				.3775	.3618
Tons of Ore Per Lb. of Powder				2.649	2.764
Cost Per Ton for Powder				.0418	.0423
" " " " Fuse, Caps, Etc.				.0118	.0101
" " " " All Explosives.				.0536	.0524

SINKING, ROCK DEVELOPMENT, ETC.

		Quantity	Average Price	Amount 1936	Amount 1935
50% Amonia Gelatin Powder	Lbs.	3850	10.58	407.27	217.12
60% Amonia Gelatin Powder	"	4700	12.14	570.50	1012.50
Total Powder 1936		8550	11.44	977.77	
Total Powder 1935		9950	12.36		1229.62
Fuse		38,700	5.67	219.66	206.56
Caps		4,600	11.22	51.59	54.36
Electric Caps & Delays		950	8.46	80.37	
Tamping Bags		300	2.10	.63	
Connecting Wire				7.50	
Total Fuse, Caps Etc.				359.75	260.92
Total All Explosives				1337.52	1490.54
Total Explosives At Mine				18000.81	11582.16
Avg. Price Per Pound For Powder				.1109	.1179

g. Mining & Loading:

The opening of three new ore areas for mining in 1936 introduced factors that effected the cost of mining and tons per man per day for the year 1936. Mining in the new areas under the hanging involved difficulties that cannot be fully overcome until mining has progressed three or four sub-levels below the hanging. Irregularities in the contact adjacent to the hanging often result in small size ore areas that have to be mined by transfer drifts and raises. There is also extra care necessary in covering down the floors and in blasting down hanging rock to form a mat, which increases the cost of production. On account of much of the ore near the

ATHENS MINE
ANNUAL REPORT
YEAR 1936

7. UNDERGROUND: (Cont'd)

g. Mining & Loading: (Cont'd)

hanging being harder, drilling is slower, and more holes are required for breaking. In two of the areas opened in 1936 the ore had to be transferred on lower sub-levels.

Electric scraper hoists were used by all the contracts in 1936, in fact they have been in general use for the past three years. On account of longer slices, larger scrapers will soon be used. Fifteen horsepower hoists are the minimum in horsepower, and it is probable that before long twenty horsepower scraper hoists will be in general use.

During the year in all areas where possible--the ore was mined by longer slices. This reduced the number of contracts working on the sub-level and only alternate raises were used, that is, only one-half the number of raises on the sub-level. New areas opened in 1936 were laid out for long slices, but in the old areas--opened many years ago, the raises were close together as at that time straight and short slices were taken on account of the low horsepower of the scraper units. With the introduction of scraper hoists of greater horsepower, longer slices were possible and also larger scrapers. The changes in practice during the past year have been along the line of longer radial slices. If this was carried out to its ultimate end, mining would be done in a complete circle around each raise. This is not practical on account of the maintenance of the drifts between the raises for traveling and ventilation roads, but, however, as much as possible of the ore at each raise is mined by radial slicing.

Loading of ore from the long raises from the 6th to the 4th levels, approximately 230 feet in length has been seriously interferred with on account of blocking of these raises. To overcome this condition, an air operated hoist was installed in #610 cross-cut and a train of cars, seven in number, is moved by this hoist and loaded while the motor works in other cross-cuts. In this way it is possible to keep the raises practically empty and avoid blocking. The long fall of the ore seems to cause it to pack so tightly in the raises that blasting is necessary to loosen it. Blasting in raises, as readily can be seen, is very destructive to cribbing and the plank lining. With the hope of decreasing the blocking of ore in the raises, it was decided to pipe water to the top of the raises and introduce it in both compartments by means of small sprays. In the long raises three sets of sprays were installed. It was hoped that the small amount of water introduced would act as a lubricant and make it easier to more the ore in the raises. This scheme has been in effect the last three months of the year and seems to have been of some benefit. There is no question but that the cribbing will last longer due to its being wet. The amount of water used does not increase the moisture in the ore as only a very small quantity is thrown by each spray.

h. Ventilation:

During the year a number of measurements were taken of the volume of air supplied by the fan on the 10th level which indicated that the fan was operating quite efficiently. The circulation of air was improved with the completion of the rock raises from the 10th to 6th levels. The work of

ATHENS MINE
ANNUAL REPORT
YEAR 1936

7. UNDERGROUND: (Cont'd)

h. Ventilation:

providing ventilation raises in rock was started in 1935 and completed late in 1936. These rock raises provide an additional outlet for the air being forced upward from the bottom of the mine by the forty thousand cubic foot fan. Several of the air-way raises in ore between these levels will be lost during the next few years due to mining operations and it was necessary to provide other airways. The problem at this mine is to force the fresh air to the areas being mined as it naturally follows the lines of least resistance which are the main level drifts and the raises between levels. Doors are in general use on the main levels to stop the air and force it up the raises from whence it again returns to the main levels on the other side of the door. In a few cases it has been necessary to use a booster fan. One result of spraying the raises has been the increased current of air that passes up the raises due to the water introduced from the sprays. This has had an appreciable effect in improving ventilation in the areas where the sprays are operating. Close attention is given to ventilation at the mine as good air is absolutely essential to maintain the efficiency of the men. It is possible that eventually a larger fan may be required to insure a sufficient volume of air. Close study will be given to this problem as it has a marked influence on the cost of production. The improvements made in 1936 consisted of the completion of the air-way raises in rock from the 10th to 6th levels and guniting of these raises from the 10th to 8th levels, also drifting for airways on the intermediate sub-levels between the 6th and 4th levels.

i. Pumping:

The Breitung pump operated the entire year and since its installation in February 1935, has been in operation for twenty-three months. This was the first full year that the benefit of pumping at the Breitung was apparent in the cost of pumping. The estimated saving of $10,000 per year was made this year by a slight margin. The gallons per minute pumped at the Athens Mine was the lowest since 1930, indicating that the Breitung pump has cut off almost all of the water which formerly entered the Athens Mine via the cave to surface. The cave occurred in June 1932, but during all of 1931 the water increased month by month indicating the existence of cracks extending to surface considerably in advance of the actual cave. The average gallons pumped per minute prior to 1931 was 225. The increase over this figure that will apparently hold fairly constant until another cave occurs is approximately thirty gallons per minute.

ATHENS MINE
ANNUAL REPORT
YEAR 1936

7. UNDERGROUND: (Cont'd)

i. Pumping: (Cont'd)

The results of pumping at the Breitung Shaft and at the Athens Mine are clearly shown by the following statement:

Period	Avg. K.W.Per Day--Athens	K.W.Per Month Breitung Pump	Avg. Gals. Per Mine.-Athens	1936 Total Cost Both Mines	1935 Total Cost Both Mines
Jan.	2847	1300	242	1779.16	2913.88 (1)
Feb.	2340	3200	244	1727.01	3188.27
Mar.	2729	2000	235	1672.10	2684.68
April	2760	4000	238	1689.06	2525.24
May	2893	5500	261	1723.96	2506.92
June	3329	6500	274	1943.53	2499.14
July	3326	4500	284	1909.15	2326.29
Aug.	3015	4100	266	1876.35	2390.55
Sept.	2987	3200	258	1715.50	2207.37
Oct.	2917	2900	261	1697.95	2061.41
Nov.	2865	2900	255	1799.55	1967.75
Dec.	2887	2700	249	1659.61	1529.20 (2)
Avg. Per Mo.-1936	2951	3567	256	1766.08	2329.72 (3)

Avg. Per Mo. prior to pumping at the Breitung-$2611.79
Reduction in cost of pumping in 1936 as compared with 1934--$10,148.52.

(1) Athens Mine only.
(2) Cost of current in December, 1935 decreased approximately 30% account of credit for Michigan sales tax for period May 1st, 1934 to June 1st, 1935.
(3) Avg. 11 mos. operating 1935--Breitung pump started in Feb. 1935.

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

Month	1936	1935	1934	1933	1932	1931	1930
January	242	367	318	372	278	243	230
February	244	361	317	358	286	244	230
March	235	313	313	340	296	250	233
April	238	292	307	326	307	253	231
May	261	290	329	365	312	255	228
June	274	293	361	416	326	282	228
July	284	288	373	422	597	262	222
August	266	278	360	411	542	263	234
September	258	263	356	399	486	262	239
October	261	261	354	356	431	263	233
November	255	253	355	342	402	268	239
December	249	249	355	326	391	274	242
Average	256	292	341	369	388	260	232

j. Shaft:

Expense for maintenance of the concrete shaft was above normal for the year. The steel sets in the circular concrete shaft, located at 10 feet centers, are too far apart to prevent vibration. The vibration causes the rivets and bolts to loosen and in time become badly worn. In some cases it has been severe enough to get the runners out of alignment due to bending of the steel members. As the working time increased last spring from three to

ATHENS MINE
ANNUAL REPORT
YEAR 1936

7. UNDERGROUND: (Cont'd)

j. Shaft: (Cont'd)

four and then to five days per week, it was noticed that the skip rope was whipping after the loaded skip entered the circular portion of the concrete shaft. This indicated that the steel members carrying the guides were loose and considerably out of line. The Mechanical Department designed reinforcing members for the steel sets and in order to get time to install them, it was decided to close the mine on Friday and work continuous eight-hour shifts from Friday morning until Monday morning. In the second week-end in May, the first reinforcing mememberss were installed on the center dividers of the 108 steel sets in the circular shaft. The following week-end reinforcing members were installed on the end dividers of the north skip road, and the third week-end, on the end dividers of the south skip road. It had also been decided to install wall brackets to stiffen the end dividers of both skip roads. These brackets were attached directly to the wall of the concrete shaft by bolts that were leaded in place. This work naturally progressed slowly as it was only done on Saturday and Sunday when the mine was idle. It was necessary to drill holes in the concrete for the brackets. During the month of June all the wall brackets were installed and a number of worn runners replaced. In July the runners were carefully plumbed in both skip roads after which the work of lining up the runners was undertaken. This work was carried on until cold weather made it necessary to stop. In order to make up the time lost on account of the week's vacation with pay and the several regular holidays in September, November, and December, it was necessary to work every Saturday starting in September. Until the cold weather stopped the repair work, it was done on three eight-hour shifts starting Sunday morning. It was impossible to complete it although all the places where the runners were badly out of line were repaired before the work was stopped. It will be resumed in the summer of 1937. As a result of the work done this year, the vibration of the skip rope has been greatly lessened, and this in turn has decreased the wear on the runners as well as the wear on the rivets and bolts of the steel sets. The cost of the repair work done this year was about two and one-half times the average maintenance cost in recent years--slightly over $5,000.00 as compared with less than $2,000.00 in other years.

8. COST OF OPERATING:

a. Comparative Mining Costs:

	1936	1935	Increase	Decrease
PRODUCT	310,888	192,534	118,354	
Underground Costs	1.131	1.345		.214
Surface Costs	.207	.215		.008
General Mine Expenses	.159	.205		.046
Cost of Production	1.497	1.765		.268
Taxes	.211	.308		.097
TOTAL COST	1.708	2.073		.365
No. Days Operated	293	303		10 days
No. Shifts & Hours	113-1-8 180-2-8	303-1-8		
Average Daily Product	1061	635	426 tons	

ATHENS MINE
ANNUAL REPORT
YEAR 1936

8. COST OF OPERATING: (Cont'd)

a. Comparative Mining Costs: (Cont'd)
COST OF PRODUCTION:

	1936	%	1935	%	Increase	Decrease
Labor	.873	58.3	.976	55.3		.103
Supplies	.624	41.7	.789	44.7		.165
Total	1.497	100.0	1.765	100.0		.268

b. Detailed Cost Comparison:

(1) Days and Shifts:

Year	Days Mine Worked	Shifts & Hours	Men Employed	Total Shifts Worked
1936	293	113-1-8 hr. 180-2-8 hr.	221	54,124-3/4
1935	303	1-8 hr.	213	38,909-3/4
Decrease	10			
Increase			8	15,215

(2) Wages:

There was a six cents (6¢) per hour increase effective November 16th.

(3) Comparison of Production:

Production - 1936	310,888
Production - 1935	192,534
Increase	118,354

(4) Comparison of Number of Men and Wages:

	No. Men	No. Days	Amount	Rate Per Day
1936	221	54,124-3/4	264,932.80	4.89
1935	213	38,909-3/4	182,736.91	4.70
Increase	8	15,215	82,195.89	.19

(5) Tons Per Man Per Day:

	1936	1935	Increase	Decrease
Surface	23.95	20.12	3.83	
Underground	7.56	6.56	1.00	
Total	5.74	4.95	.79	

(6) Cost of Production:

	Total	Cost Per Ton
1936	465,471.45	1.497
1935	339,949.82	1.765
Increase	125,521.63	Decrease .268

	Labor	%	Supplies	%
1936	271,288.68	58.3	194,182.77	41.7
1935	187,999.48	55.3	151,950.34	44.7
Increase	83,389.20		42,232.43	

ATHENS MINE
ANNUAL REPORT
YEAR 1936

8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison: (Cont'd)

(7) Detail of Accounts:

	1936		1935		Increase or Decrease	
Days per Week	6 & 5		4 & 6			
Shifts and Hours	473		303		170	
Production, Tons	310,888		192,534		118,354	
Average Daily Product,Tons	1,061		635		426	
Number of Days Worked	113-1-8 hr. 180-2-8 hr.		303-1-8 hr. --------		170-8 hr. shifts	
UNDERGROUND COSTS:	Amount	Per Ton	Amount	Per Ton	Amount	Per Ton
1. Exploring in Mine	79.98	.000	82.07	.000	209.00	
2. Sinking in Shaft						
3. Development in Rock	9228.41	.030	7130.27	.037	2098.14	.007
4. Development in Ore	13144.97	.042	7488.12	.039	5656.85	.003
5. Stoping	104306.98	.336	61445.27	.319	42861.71	.017
6. Timbering	111359.40	.358	75871.53	.394	35487.87	.036
7. Tramming	30152.40	.097	19733.45	.102	10418.95	.005
8. Ventilation	3415.55	.011	4904.16	.026	1488.61	.015
9. Pumping	21192.93	.068	28740.89	.149	7547.96	.081
10. Compressors and Air Pipes	30542.02	.098	24641.51	.128	5900.51	.030
11. Back Filling						
12. Undg. Superintendence	9742.51	.031	7093.27	.037	2649.24	.006
13. Cave-in						
14. Maint: Comp. & P. Drills	1358.44	.004	1932.69	.010	574.25	.006
15. " Scraper	9770.84	.032	7553.25	.039	2217.59	.007
16. " Elec. Tram Equip.	6284.32	.020	6843.87	.036	559.55	.016
17. " Pumping Machy.	1109.21	.004	5571.08	.029	4461.87	.025
Total Undg. Costs	351687.96	1.131	259031.43	1.345	92656.53	.214
SURFACE COSTS:						
18. Hoisting	27779.06	.089	19052.12	.099	8726.94	.010
19. Stocking ore	4260.57	.014	2939.84	.015	1320.73	.001
20. Screening--Crushing at Mine						
21. Dry House	5615.25	.018	4378.91	.023	1236.34	.005
22. Gen'l Surface Expense	4719.74	.015	4692.91	.024	26.83	.009
23. Maint: Hoisting Equipment	7808.26	.025	5620.20	.029	2188.06	.004
24. " Shaft	5114.16	.017	2023.59	.010	3090.57	.007
25. " Top Tram Equipment	2399.27	.008	1103.51	.006	1295.76	.002
26. " Docks, Trestles,Pkts.	713.92	.002	925.85	.005	211.93	.003
27. Mine Buildings	6012.03	.019	751.72	.004	5260.31	.015
Total Surface Costs	64422.26	.207	41488.65	.215	22933.61	.008
GENERAL MINE EXPENSES:						
27B. Employees Vacation Exp.	4167.35	.013			4167.35	.013
28. Insurance	409.06	.001	441.40	.002	32.34	.001
29. Mining Engineering	1466.09	.005	997.68	.005	468.41	.000
30. Mech. & Elec. Engr.	1543.91	.005	1487.97	.008	55.94	.003
31. Analysis & Grading	7686.77	.025	5387.47	.028	2299.30	.003
32. Personal Injury	8334.92	.027	8321.55	.043	13.37	.016
33. Safety Department	1060.37	.003	563.34	.003	497.03	.000
34. Telephones and Safety Devices	2182.57	.007	1707.20	.009	475.37	.002
35. Accrued Unemploy. Tax	2766.87	.009			2766.87	.009
36. Spec. Exp., Pen. & Allow.	2021.46	.007	4771.59	.025	2750.13	.018
37. Ishpeming Office	5455.58	.018	4273.27	.022	1182.31	.004
38. Saranac Investigation	1427.92	.005	1407.10	.007	20.82	.002
39. Mine Office	10683.69	.034	10071.17	.053	612.52	.019
Total Gen'l Mine Exp.	49206.56	.159	39429.74	.205	9776.82	.046
COST OF PRODUCTION	465316.78	1.497	339949.82	1.765	125366.96	.268
40. Taxes	65642.79	.211	59335.80	.308	6306.99	.097
TOTAL COST	530959.57	1.708	399285.62	2.073	131673.95	.365

ATHENS MINE
ANNUAL REPORT
YEAR 1936

8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison: (Cont'd)

(7) Detail of Accounts:

UNDERGROUND COSTS:

1. Exploring in Mine:

Covers a proportion of expense of Geological Dept. based on actual time spent at property. The expense was practically the same as in 1935.

3. Development in Rock:

Increase of 113 feet drifting and raising in 1936, account of development of new mining area north of the fault dike in the west half of block No. 4 and more raising in rock for ventilation air-ways.

4. Development in Ore:

Increase of 1166 feet drifting and raising in 1936, account of development of two new mining areas, (ore body on the north and on the south sides of the fault dike in west half of block No. 4) and completion of development of the ore body near the south footwall in the west half of block No. 4 which was started in 1935.

5. Stoping:

Labor cost increased $34,994.44 and supply cost $7867.27 on account of 170 more shifts worked in 1936. Cost per ton increased .017, of which .0012 was in the cost for explosives. The increased cost per ton was largely due to mining in new area under the hanging, account of irregularities in the contact of the ore and jasper increasing the cost of stoping. Extra care in covering down the floors of several new sub levels to prevent runs of jasper also increased the stoping cost.

6. Timbering:

The cost per ton timbering decreased $ .036 in 1936. The cost per ton for timber, lagging and poles only decreased $ .0024 so most of the decrease in 1936 was in the labor cost. Increased production due to working 170 more shifts with repair expense about the same as in 1935 accounts for the decreased cost per ton for labor. The cost continues above the cost in years prior to the depression, which is still influencing the cost per ton. The extra cost for timbering on account of the shut downs in 1932 and 1933 and the low operating schedules in effect from 1931 to 1936 have now been largely overcome. The amount of treated timber used in the mine in 1936 increased nearly 60%. The intermediate sub levels between the 6th and 4th levels, used for ventilation air-ways and as traveling roads, were timbered with treated timber in 1936.

7. Tramming:

The increase in expense was $10,418.95 and the decrease in cost per ton $ .005.

8. Ventilation:

There was a decrease in cost for electric power of $1,286.10 in 1936. No new fans were purchased in 1936 or 1935.

ATHENS MINE
ANNUAL REPORT
YEAR 1936

8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison: (Cont'd)

(7) Detail of Accounts:

UNDERGROUND COSTS:

9. Pumping:

Expense decreased $7,547.96 in 1936 and cost per ton, $.081. The average gallons per minute pumped at Athens was 256 in 1936, in 1935, was 293. The pump at the Breitung Shaft of the Jones & Laughlin Steel Company operated all the year. For more detail, see paragraph under heading "7-i Pumping".

10. Compressors & Air Pipes:

Expenditures increased $5900.51 in 1936 and cost per ton decreased .030.

Cu. ft. air compressed - 1936	698,985,000
Cu. ft. air compressed - 1935	527,355,000
Increase - 1936	171,630,000

Cubic feet of air compressed increased 33% in 1936, and the mine operated 170 more shifts. Cost of electric current used by the compressors increased $5437.24, but the cost per ton was $.018 less.

Cost of Electric Current-1936	$23,098.72
Cost of Electric Current-1935	17,661.48
Increase-1936	$ 5,437.24

12. Underground Superintendence:

Increase in expense due to mine operating 170 more eight-hour shifts. There was an increase in the salary of the Mining Captain. Expenditures increased $2649.24, and cost per ton decreased $.006.

14. Compressors & Power Drills:

New drill machines purchased:

1-S49 Wet type Jackstoper	300.00
5-RB12 Ing.-Rand Jackhammer Each $190.00	950.00
Freight on drills	4.44
	$ 1254.44

Cost of new drill machines in 1935 was $1460.00.

Repairs to compressors $104.00 in 1936, while in 1935 they were $320.00. Total Expenditures decreased $574.25, and cost per ton decreased $.006.

15. Scrapers & Mechanical Loaders:

In 1936 purchased:

2 new 15-H.P. Sullivan Electric Scraper Hoists, Cost with frgt. $2334.35.

ATHENS MINE
ANNUAL REPORT
YEAR 1936

8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison: (Cont'd)

UNDERGROUND COSTS: (Cont'd)

15. Scrapers & Mechanical Loaders: (Cont'd)

Cables and switches for installing new scraper hoists, new scraper lips for repairing scrapers, and more wire rope used on account of mine operating 170 more shifts in 1936.

In 1935, four second hand Sullivan Scraper Hoists, costing $2000 purchased from Wade Mine equipment. Expenditures in 1936 increased $2217.59 and cost per ton decreased $.007.

16. Electric Tram Equipment:

Detail:	Generator	Locomotives	Wiring	M. L. Tracks	M. L. Cars
1936	57.51	1482.90	603.27	2877.85	1262.79
1935	94.15	1142.11	652.29	3631.71	1323.61
Increase		340.79			
Decrease	36.64		49.02	753.86	60.82

More repairs to locomotives.
Less repairs to generator, trolley lines, and M. L. Cars.
Decrease in expense for M. L. Tracks due to replacing 30 lb. rail on 8th level with 40 lb. rail in 1935.

17. Pumping Machinery:

Decrease due to extraordinary expense in 1935 for installing pump and discharge line in Breitung Shaft, and enlarging the sump on 10th level at Athens.

Expenditures decreased $4461.87 and cost per ton, $.025.

SURFACE COSTS:

18. Hoisting:

Ore & rock hoisted:

	Ore	Rock	Total
1936	310,888	7,716	318,604
1935	192,534	13,326	205,860
Incr. 1936	118,354		112,744
Decr. 1936		5,610	

Expenditures increased $8,726.94 and cost per ton decreased $.010. Cost per K. W. for current decreased $.00033 in 1936.

19. Stocking Ore:

Tons stocked in 1936:	141,347
Tons stocked in 1935:	102,368
Increase 1936:	38,979

Expenditures increased $1320.73 and cost per ton decreased $.001.

ATHENS MINE
ANNUAL REPORT
YEAR 1936

8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison: (Cont'd)

(7) Detail of Accounts: (Cont'd)

SURFACE COSTS:

21. Dry House:

Increase in expense due to mine operating 170 more shifts during year, hence more labor and expense for fuel.

Expenditures increased $1236.34 and cost per ton decreased $.005.

22. General Surface Expense:

Expense was almost the same in both years.
The cost per ton decreased $.009 in 1936.

23. Maintenance - Hoisting Equipment:

Detail:	Elec. Hoist	Rope	Skips & Skip Roads	Sheaves
1936	924.53	3055.73	3600.82	227.18
1935	1163.01	1456.34	2953.73	47.12
Increase		1599.39	647.09	180.06
Decrease	238.48			

Net increase $2188.06 in expenditures and decrease in cost per ton $.004.
Less repairs to hoists and bell signals.
Two 1-3/8" hoisting ropes charged in 1936; only one in 1935.
More repairs to skips and skip roads, and more expense for overhauling cage.
Replaced a set of steel linings and bolts on head frame sheave and $85.00 charged for rubber lining for pulley stand sheaves.

24. Shaft:

Detail:	Steel Sets	Undg. Pockets
1936	4478.75	635.41
1935	875.36	1148.23
Increase	3603.39	
Decrease		512.82

All of the steel sets in the circular concrete shaft were reinforced. See "Underground" for detail.

Decrease in expense to U. G. Pockets due to enclosing in 1935 the two transfer raises 6th to 8th levels at the shaft, across the opening on the 7th level with concrete walls 12" thick.

25. Top Tram Equipment:

Detail:	Engines & Motors	Wire Rope	Sheaves, Rollers, etc.	Tracks & Cars.
1936	1044.75	250.00	520.10	584.42
1935	167.94		318.49	617.08
Increase	876.81	250.00	201.61	
Decrease				32.66

The expense to Engines and Motors includes the expense for relocation of top tram control house, and replacing old cables with asbestos covered or fire resisting cables.

ATHENS MINE
ANNUAL REPORT
YEAR 1936

8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison: (Cont'd)
(7) Detail of Accounts: (Cont'd)

SURFACE COSTS: (Cont'd)

25. Top Tram Equipment: (Cont'd)

One new top tram rope put on in 1936; none, in 1935.
Replaced more sheaves and rollers on top tram.
Less repairs to tracks and cars.
Increase in expenditures $1295.76 and in cost per ton $.002.

26. Docks, Trestles and Pockets:

The decrease in expense was due to replacing part of the decking timber on stocking trestle in 1935.

The expense in 1936 was for repairs to skip dump; New plates in ore pockets; and repairing the rock trestle.

Expenditures decreased $211.93 and cost per ton $.002.

27. Mine Buildings:

Detail:	1936		1935
Shops--Rewiring	283.49	Repair roof.	195.95
Shaft House--Fireproof enclosure	3831.01		
Engine House	979.71	Repair roof.	173.07
Boiler "		Repair roof.	7.02
Dry House-Rewiring, Elec. cap lamp room.& New entrance to Storage Bldg. Heat. plant.	851.46	" "	182.41
		Making room into garage	157.88
Top Tram House-New fire proof control house.	66.36	----------	
Timber Tunnel		Repair doors	35.39

Expenditures increased $5260.31 and cost per ton $.015.

27B Employees Vacation Expense:

GENERAL MINE EXPENSES:

28. Insurance:

Covers cost of fire, boiler & auto insurance. Cost slightly lower in 1936.

29. Mining Engineering:

Covers time and expense of engineers actually spent at the property. Increase in 1936 due to mine operating 170 more shifts.

30. Mechanical and Electrical Engineering:

Covers a proportion of Mechanical and Electrical Engineering Department expense based on actual time spent at property. In crease due to mine operating more days and supervision of steel construction in shaft house for enclosing with fire proof material.

ATHENS MINE
ANNUAL REPORT
YEAR 1936

8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison: (Cont'd)
(7) Detail of Accounts: (Cont'd)

GENERAL MINE EXPENSE:

31. Analysis & Grading:

1936	18,043	determinations	@ $.221407	per determination.
1935	14,494	determinations	@ .203910	" "
Increase	3,549		.017497	" "

More ore shipped.

32. Personal Injury:

	1936	1935	
Compensation Dept.	560.77	528.55	
Catastrophe Insurance	221.39	153.60	.08 per $100 Labor
Personal Injury	6669.85	6834.69	-2% plus compensation on accidents prior to May-1933.
Ishp. Hospital Loss	882.91	804.71	
	8334.92	8321.55	

Expense for 1936 and 1935 practically the same.

33. Safety Department:

Safety cash awards--paid in December--$255.00.
Increase in first aid supplies and more expense for first aid and helmet practice.

34. Telephones & Safety Devices:

Detail:	Lights Shaft & Levels	Mine Telephones	Safety Gates & Undg. Improv.	Sign Boards & Signals	Fire Equip.
1936	1964.12	103.22	82.28	28.40	4.55
1935	1518.00	49.46	23.60	16.45	99.69
Increase	446.12	53.76	58.68	11.95	
Decrease					95.14(1)

(1) Five acid fire extinguishers purchased in 1935.
Increase due to mine operating 170 more shifts in 1936.

35. Accrued Unemployment insurance tax. New tax in 1936.

36. Special Expense, Pension & Allowances:

Covers special donations, dues, and assessments in Lake Superior Iron Ore Association and donated house rents. The decrease in 1936 is due to less special donations and less donations for house rents.

37. Ishpeming Office Expense:

Proportion of Ishpeming Office expense prorated to various mines on basis of labor.

ATHENS MINE
ANNUAL REPORT
YEAR 1936

8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison: (Cont'd)
(7) Detail of Accounts:

GENERAL MINE EXPENSE:

38. Saranac Investigation:

Represents physical examination of men employed at the mine at $4.00 per man; also a proportion of cost of Saranac Laboratory Contract which is prorated on a labor basis.

39. Mine Office:

Increase in Central Warehouse expense	$486.77 (1)
" " Salaries	48.16
" " Printing & Stationery	77.59

(1) Based on purchases made by mine from Central Warehouse Stocks.

40. Taxes:

Taxes paid in 1936 and 1935 were as follows:

	1936	1935
City Tax	65,642.79	59,335.80
Capital Stock Tax	30.00	146.00
Ohio Franchise Tax	1,467.28	1,564.05
Total	67,140.07	61,045.85

The city tax rate increased $3.271 per $1000 valuation.

9. EXPLORATIONS AND FUTURE EXPLORATIONS:

There was no diamond drilling on the Athens property in 1936 and none is contemplated at this time.

0. TAXES:

A comparison of assessed valuations and taxes for 1936 and 1935 follows:

	1936		1935	
Description	Valuation	Taxes	Valuation	Taxes
Realty (Tax Commission)	1,535,000	52,361.07	1,490,000	45,942.66
Ore in Stock, Equip. Etc.	365,000	12,450.67	410,000	12,641.94
Total by Tax Commission	1,900,000	64,811.74	1,900,000	58,584.60
Sterling Addition	4,140	141.20	4,140	127.66
Harvey Plat	1,170	39.92	1,170	36.03
Total	1,905,310	64,992.86	1,905,310	58,748.29
Collection Fees		649.93		587.51
	1,905,310	65,642.79	1,905,310	59,335.80
Rented Buildings:				
Harvey Plat	3,780	128.94	3,780	116.57
Sterling Addition	20,430	697.07	20,430	629.99
Total	24,210	826.01	24,210	746.56
Collection Fees		8.26		7.47
Total Athens Rented Bldgs.	24,210	834.27	24,210	754.01
Total Athens Iron Mining Co.	1,929,520	66,477.06	1,929,520	60,089.81
Tax Rate		3.4111		3.082
Total Tax-City of Negaunee		406,945.23		366,574.10
Athens Iron Mining Co. % of City Tax		16.33%		16.39%

ATHENS MINE
ANNUAL REPORT
YEAR 1936

10. TAXES: (Cont'd)

There was no change in the assessed valuation of the Athens Mine in 1936. The realty value was increased $45,000.00 by the Tax Commission and the value of the ore in stock reduced $45,000.00, making the final valuation the same as in 1935. The valuation of all other real estate and rented buildings owned by the Athens Iron Mining Company was the same as in 1935, viz., $24,210.00. The total taxes levied against the Athens Iron Mining Company was $6,387.25 higher than in 1935 due to an increase in the Negaunee city tax rate of $3.271 per $1000.00 valuation. The percentage of city taxes paid by the Athens Iron Mining Company in 1936 was 16.33 as compared with 16.39 in 1935.

11. ACCIDENTS & PERSONAL INJURY:

The following statement gives the record of accidents for the years 1932 to 1936 inclusive. There were seven lost time accidents in 1936 as compared with three in the previous year. This is the worst record in the last six years. There were more men employed and days worked this year than in any other year during this period. Two of the seven accidents were classed by the Central Safety Committee as trade risks and five as preventable accidents. The nature of the accidents causing the lost time were as follows: Two cases of broken ribs, one of hernia, two fractures of legs, one contusion of back and one laceration of ankle. Three of the injured men have returned to work and four are still drawing compensation.

	1936	1935	1934	1933	1932
Fatal	0	0	0	0	0
Time lost - Over 4 months	3	1	1	0	2
" " - One to 4 months	3	2	0	1	0
" " - Less than one month	1	0	0	0	0
Total Compensable Accidents	7	3	1	1	2
Number of cases paid compensation for accidents prior to Jan. 1st, 1936	6	7	7	14	12
Number of cases paid difference in wages (Included in above total)	3	4	4	4	4

12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION:

E. & A. No. 718 covered fire-proofing the Athens Mine shaft house. Work was started in June and completed in November except for painting the exterior of the steel Ferrobord covering. A detailed description of the work is given under the heading -6--Surface, sub-heading-a-6.

13. EQUIPMENT AND PROPOSED NEW EQUIPMENT:

a. Steam Shovels:

The ore at the Athens Mine was loaded from stockpile by No. 42 shovel owned by the Cleveland-Cliffs Iron Company which was rented to the Athens Iron Mining Company.

b. Stockpiles, Trestles & Docks:

The wooden trestle that was erected a number of years ago for stocking ore when the two steel trestles were filled, was dismantled during the summer. It was expected that some of this ore would be loaded for shipment this year, but due to the increase in shipments from pockets, it was not necessary to load from this pile.

ATHENS MINE
ANNUAL REPORT
YEAR 1936

13. EQUIPMENT, ETC.:

c. Scraper Hoists:

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

	On Hand 1-1-36	Purchased 1936	Total on Hand 12-31-36	Repair Cost Per Machine for year
Sull. 15 H. P. Elec.	15	2	17	57.33
" 20 H. P. "	2	0	2	65.51
Ing. Rand 10 H. P. Elec.	2	0	2	34.62
	19	2	21	

Only two scraper hoists were purchased in 1936, although orders were placed late in the year for purchase of five 15 H.P. Ingersoll Rand scraper hoists--E & A-705. These new hoists will be required on account of the increase in the production schedule for 1937.

d. Drill Machines:

The following new drill equipment was purchased in 1936:

Description:	Cost
1-S49 Ing-Rand W. T. Jackstoper	300.00
5-RB12 Ing-Rand Jackhammers (190 ea.)	950.00

The S49 machine was purchased for use in hard rock raises. It is a wet machine and uses 7/8" hollow hexagon jack rods and jack bits.

The 5-RB12 jackhammers replaced 5-BBR230 jackhammers that were worn out.

E. & A. #705 authorized late in the year, covered purchase of 6 RB12 Ingersoll Rand jackhammers. The new drill machines will replace worn out BBR230 machines and furnish machines for new gangs of miners to be added as soon as working places become available.

e. Motor Haulage Cars:

Two 65 cu. feet rocker dumps underground haulage cars were ordered late in the year, E. & A. 705 for the 7th level. The increased production schedules for 1937 made it necessary to increase the haulage equipment. They will be delivered in January 1937.

f. Double Deck Cage:

E. & A. 705 also covered building of a double deck aluminum cage in the general shops at Ishpeming. This new cage will replace the present single deck cage and although double deck will weigh less. It will cut the trips by the cage about 40%, and it is estimated will save the cost in less than two years. It should be completed and in service within ninety days.

14. MAINTENANCE & REPAIRS:

Expenditures in 1936 for "Maintenance & Repairs" in the accounts listed under "Underground Costs" decreased approximately 15%.

The account "Compressors and Power Drills" decreased $574.25due to the purchase of less drill machines and no expense for repairing inter-cooler.

The account "Scrapers & Mechanical Loaders" increased $2217.59 due to more expense for repairing the scraper equipment. Also more wire rope

ATHENS MINE
ANNUAL REPORT
YEAR 1936

14. MAINTENANCE & REPAIRS: (Cont'd)

was used on account of more contracts working and increased operating schedule. There were two new fifteen horsepower scraper hoists purchased in 1936 at a cost of $2334.00 as compared to four second-hand machines purchased in 1935 at a cost of $2000.00.

The account "Electric Tram Equipment" decreased $559.55 in 1936. There was less expense incurred for repair of haulage tracks. In 1935 much of the rail on the 6th level was replaced and a track laid in a new cross-cut on the 6th level. The overhauling of the tram cars which were not repaired in 1935, were completed in 1936.

The account "Pumping Machinery" decreased $4461.87 in 1936. The decrease was due to the unusual expense incurred in 1935 for the clean-out drift and enlargement of the sump on the 10th level and also for cleaning the old sump. The cost of this work was approximately $4500.00, so that the actual maintenance of the pumping equipment in the mine was almost exactly the same in both years.

The total decrease in maintenance accounts under the general division "Underground Costs" was $3,378.08 in 1936.

Expense for surface maintenance in 1936 was much higher than in 1935. Four of the five accounts under "Surface Costs" showed large increases and the other a slight decrease. The actual increase as compared with 1935 was 111%.

Maintenance of Hoisting Equipment increased $2188.06 or 38% above the cost in 1935. Two new hoisting ropes were charged out, and part of the cost of one put in service in December 1935, as compared with one new rope and balance on another one in 1935. Repairs to the skip roads were heavy following the reinforcing of the steel sets in the circular concrete shaft. A cage was also overhauled in the general shops.

Maintenance of the shaft:
The increase in this account was $3090.57 which represents the cost of repairing and reinforcing the steel sets in the circular concrete shaft.

Maintenance of Top Tram Equipment increased $1295.76 due largely to extraordinary costs incurred account of changing location of top tram engine house as part of the work of making the shaft house fireproof. The change made it necessary to extend the electric cables to the new location at which time the old cables were also replaced with asbestos or fire resisting cables.

Maintenance Docks, Trestles, And Pockets.
Expense for maintenance was slightly lower in 1936. The expenditures in this account covered repairs to skip dumps, new plates in ore pockets and repairs to the rock trestle.

Maintenance Buildings.
There was a large increase $5260.31 in expenditures in this account. The rewiring of the shop buildings cost $283.49, fireproofing the shaft house $3831.01, new roof on engine house and repairs to interior $979.71, room in dry house for Edison Cap Lamps and stairway from dry to heating plant $851.46, and the new fire proof top tram engine house $66.36.

The total maintenance expense under Surface Costs was $22,047.64 in 1936 as compared with $10,424.87 in 1935. Many of the expenditures were for extraordinary items that will not occur again in the life of the mine.

ATHENS MINE
ANNUAL REPORT
YEAR 1936

15. POWER:

Detail of Electric Current purchased compared with 1935:

	1936 - 12 mos. Optg.		1935 - 12 mos. optg.	
	Cost	Per Ton	Cost	Per Ton
Stoping	771.07	.003	510.00	.003
Ventilation	2281.59	.007	3567.69	.018
Pumping	16677.77	.054	20255.30	.105
Hoisting	21908.09	.070	14806.36	.077
Stocking Ore	571.32	.002	300.48	.002
Dry House	91.21	.000	61.13	.000
Light at Levels	1129.65	.004	1116.31	.006
Compressor	23098.72	.074	17661.48	.092
Electric Haulage	1383.65	.004	1272.48	.007
Shops	180.97	.001	78.44	.000
Heating Plant	16.72	.000	12.27	.000
Office	17.08	.000	14.17	.000
Total	68127.84	.219	59656.11	.310
Main Line Meter	4,634,958 K.W.		3,986,097 K.W.	
Product	310,888		192,534	
K.W. Per Ton	14.91		20.61	
Cost per K.W. (Avg.)	.0147		.01503	
15 Min. Demand (Avg.)	1193 K.W.		1127 K.W.	
Load Factor (Avg.)	43.5%		39.4%	

The cost per K. W. was below the above average of .0147 in the latter months of the year due to the larger load factor caused by the heavier operating schedule.

17. CONDITION OF PREMISES:

b. Athens Mine Houses:

The following statement gives the total cost of repairs and the average cost per house for the past five years:

Year	Amount	Cost Per House
1936	6,680.02	222.67
1935	2,654.63	88.49
1934	2,088.70	69.32
1933	852.41	28.41
1932	419.20	13.97

Repairs in 1936 included exterior painting of twelve houses with the necessary repairs to siding, windows, doors, porches, steps, etc. prior to painting. There were six garages built, the old barns and sheds were torn down by the tenant at no cost to the company. New foundations were placed under one house and a cellar partly excavated.

ATHENS MINE
ANNUAL REPORT
YEAR 1936

18. NATIONALITY OF EMPLOYEES:

The following statements show: first, the nationality of employees as to parentage, secondly, a separation of nationalities into American and foreign born:

As to Parentage	1936	%	1935	%
English	43	19.5	43	20.2
Finnish	91	41.1	87	40.8
Italian	38	17.2	36	16.9
Swedish	16	7.2	16	7.5
French (Canadian)	20	9.	18	8.5
Scotch	1	.5	1	.5
German	6	2.7	5	2.3
Austrian			1	.5
Norwegian	3	1.4	3	1.4
Irish	2	.9	2	.9
Danish	1	.5	1	.5
Total	221	100.	213	100.

	American Born		Foreign Born	
As to Birth	1936	1935	1936	1935
English	27	28	16	15
Finnish	45	42	46	45
Italian	14	12	24	24
Swedish	14	13	2	3
French (Canadian)	20	18		
Scotch	1	1		
German	6	5		
Austrian		1		
Norwegian	3	3		
Irish	2	2		
Danish	1	1		
	133	126	88	87
	60.2%	59.2%	39.8%	40.8%

In 1936, the percentage of American born increased 1%.

LUCY MINE
ANNUAL REPORT
YEAR 1936

1. GENERAL:

The fences around the open pits were inspected and repaired in the spring.

10. TAXES:

	1936		1935	
	Valuation	Taxes	Valuation	Taxes
Various Parcels	$ 37,260	$ 1271.04	$ 38,250	$ 1179.53
Collection Fees		12.71		11.80
Total Taxes		$ 1283.75		$ 1191.33
City of Negaunee Tax Rate Per $100.00		$ 3.09		$ 3.411

Taxes increased due to higher tax rate.

MAAS MINE
ANNUAL REPORT
YEAR 1936

1. GENERAL

The Maas Mine operated continuously through the year 1936. The working schedule was increased from three days per week in January to four days per week February 1st and then to five days per week May 1st, at which latter rate the mine was operated during the remainder of the year. From May 1st, there were two regular crews, one on day shift and one on night shift, with a third crew composed of trammers underground and top landers on surface to hoist the additional ore which could not be handled on the two regular shifts.

Mining in the East footwall pillar above the Third Level was more extensive than for the past several years as a large product was desired and there was not sufficient room for these contracts elsewhere. This is a very wet area requiring drainage drifts in the footwall before the ore in the hanging can be mined and consequently is not a territory where very efficient results can be obtained.

A new stope was developed on the footwall in the Western area above the Third Level and this together with the two other contracts mining in this area obtained a very good tonnage at low cost. The territory from which the balance of the product came was in the Race Course and "Area 2" South of the Race Course, mostly below the Fourth Level. The conditions here are very favorable except that the territory is hardly large enough for the number of contracts required to produce the desired tonnage. Crushing in this territory, which was considerable of a handicap in previous years, was somewhat eliminated when the mining progressed below the Fourth Level. Approximately 70% of the ore produced came from this area.

About the middle of the year, when it was learned that less ore of Bessemer grade was desired, development of a new block to the East of the Race Course and above the Fourth Level in a Non-Bessemer territory was started and by the end of the year, seven contracts had been transferred to this area which has lowered the percentage of Bessemer approximately 10%. Development work for the year has been confined nearly entirely to raising from the Fourth and Fifth Levels. No. 7 Crosscut on the Fifth Level was started early in the year but so much difficulty was experienced on account of the water from No. 2 diamond drill hole and as the Crosscut was in very low grade ore, it was decided to stop this development. Any ore that would have been encountered above this crosscut would have been mostly of Bessemer grade, which was another factor in dediding to discontinue work in this territory for the present.

Shipments from the Maas were 248,933 tons more than in 1935 and 34,458 tons in excess of this year's production.

MAAS MINE
ANNUAL REPORT
YEAR 1936

A decided innovation was introduced at the Maas Mine in 1936 when the change was made from carbide lamps to electric battery cap lamps. This change was made in January by purchasing approximately one-half the required amount and putting the electric lamps on one shift and allowing the smaller shifts to use carbide lamps.. As soon as the men became accustomed to their use and the method of handling and charging the batteries was worked out satisfactorily, additional lamps were purchased and at the end of the year the mine was 100% electrified. This change does away with the ever present danger from fire and also a further hazard of a possible premature explosion when the miners are charging their holes, caused by inadvertently lighting a fuse from the lamp in their hat in case they neglected to hang it up before spitting their fuse. The electric light is also much brighter, eliminates the trouble of refilling and relighting as with the carbide, and now that the men are used to carrying the extra weight, is proving extremely satisfactory.

2. PRODUCTION SHIPMENTS & INVENTORIES

a. Production by Grades

	1936	1935	Increase
Maas Bessemer	88,324	81,155	7,169
Race Course Bessemer	57,178	49,286	7,892
Maas	245,251*	172,723	72,528
Race Course	157,720	60,316	97,404
Total	548,473	363,480	184,993
Rock	13,856	9,929	3,927
Total Hoist	562,329	373,409	188,920

* Includes 12,713 tons stockpile overrun. 1935 stockpile overrun 9,011 tons, 1936 overrun 3,702 tons.

161,901 tons or 30% of the production was Bessemer grade.

b. Shipments

Grade of Ore	Pocket Tons	Stockpile Tons	Total Tons	Total Last Year
Maas Bessemer	24,819	59,068	83,887	78,587
Race Course Bessemer	19,442	34,059	53,501	49,604
Maas	121,832	175,514	297,346	155,745
Race Course	99,496	48,701	148,197	50,062
Total	265,589	317,342	582,931	333,998
Total Last Year	146,845	187,153	333,998	
Increase	118,744	130,189	248,933	

Included in the above is 32,203 tons shipped all rail to Charcoal furnaces.

MAAS MINE
ANNUAL REPORT
YEAR 1936

c. Stockpile Inventories

Grade of Ore	12-31-36	12-31-35	Increase	Decrease
Maas Bessemer	26,211	21,774	4,437	
Race Course Bessemer	15,079	11,402	3,677	
Maas	43,947	96,042		52,095
Race Course	22,345	12,822	9,523	
Total	107,582	142,040		34,458

d. Division of Product by Levels

	1936	%	1935	%
Third Level	137,828	25.0	83,391	23.0
Fourth Level	206,539	38.0	268,880	74.0
Fifth Level	204,106	37.0	11,209	3.0
Total	548,473	100.0	363,480	100.0

e. Production by Months

Month	Maas Bess.	Maas	R. C. Bess.	Race Course	Total	Rock
January	6,457	10,567	3,215	8,400	28,639	1,062
February	8,620	12,557	5,464	7,844	34,485	1,150
March	8,820	12,297	4,604	9,070	34,791	1,859
April	11,135	10,925	5,615	7,912	35,587	1,224
May	9,340	17,405	5,582	14,234	46,561	2,420
June	6,683	14,615	8,553	15,561	45,412	1,012
July	6,995	20,041	9,126	17,360	53,522	614
August	6,889	19,039	5,189	13,617	44,734	933
September	9,270	22,700	5,708	17,884	55,562	578
October	10,019	27,755	3,032	14,899	55,705	1,359
November	8,210	25,603	3,724	12,557	50,094	901
December	7,010	27,910	2,641	13,107	50,668	744
Total	99,448	221,414	62,453	152,445	535,760	13,856

1936 Stockpile Overrun 12,713
548,473

The product was distributed as follows:

	1936	1935	Increase
George Maas Lease	265,312	217,752	47,560
Catholic Cemetery	42,670	19,186	23,484
American Mining Co.	6,479	2,736	3,743
C.C.I.Co.(Right of Way)	11,221	6,634	4,587
Race Course	214,845	115,946	98,899
City of Negaunee	7,946	1,226	6,720
	548,473	363,480	184,993

MAAS MINE
ANNUAL REPORT
YEAR 1936

f. Ore Statement

	Maas Bess.	Maas	R. C. Bess.	Race Course	Total	Total Last Year
On hand 1-1-36	21,774	96,042	11,402	12,822	142,040	112,558
Product for year	99,448	221,414	62,453	152,445	535,760	363,480
Transf. to & from	11,124	11,124	5,275	5,275		
Overrun		12,713*			12,713	
Total	110,098	341,293	68,580	170,542	690,513	476,038
Shipments	83,887	297,346	53,501	148,197	582,931	333,998
Balance on hand	26,211	43,947	15,079	22,345	107,582	142,040
Increase in output					184,993	
Decrease in ore on hand					34,458	

* Previous year's overrun 9,011 tons.
Current year's overrun 3,702 tons.

Estimated stockpile overrun end of 1936 season:

Maas Bessemer	15,000 tons
Maas	25,000 "
Race Course Bessemer	5,000 "
Race Course	10,000 "
Total Estimated Stockpile Overrun	55,000 tons

Overrun Shipped 1936 12,713 tons

1936 1 8-hr. shift, 6 days per week, 2 crews working alternate weeks, January 1st to February 1st; 6 days and 2 nights per week with 2 crews averaging 4 days per week, February 1st to May 1st. 2 8-hour shifts 5 days per week with 1 extra 8-hour hoisting shift from May 1st through the balance of the year. Starting November 15th, a few mining crews were gradually added to this third shift. About October 1st the straight 8-hour shift was put into operation. Under this schedule the men take their lunches underground with them and relieve their opposite partners in the working places, thus having the entire 8 hours for work instead of loosing part of their time in going to and from their working places. They do not take time out for lunch, arranging to eat when it does not interfere with their operation.

1935 1 8-hr. shift, 4 days per week, 2 crews working alternate weeks, January 1st to February 11th. Six days per week, 2 crews working each 3 days from February 11th through balance of year.

MAAS MINE
ANNUAL REPORT
YEAR 1936

1934 1 8-hr. shift, 6 days per week and 5 nights in six Bessemer places; 3 crews working 3 and 4 days per week January 1st to September 1st. 4 days per week and 4 nights in six Bessemer places; 3 crews working 2 or 3 days per week September 1st to December 31st, 1934

1933 1 8-hr. shift, 4 days per week, 2 crews working alternate weeks, January 1st to April 8th. Mine idle from April 8th to July 1st.
Six days per week, 3 crews 2 days each, April 8th to July 1st. 5th Level development.
6 days per week 3 crews 2 days each, July 1st to August 1st, Bessemer production and 5th Level development.
5 days per week, 2 crews working alternate weeks, August 1st to November 13th; 6 days per week and 5 nights, 3 crews working 3 or 4 days per week, November 13th to December 31st.

1932 1 8-hr. shift, 2 days per week, January 1st to May 31st.
Mine idle June 1st to October 31st.
2 days per week, November 1st to December 31st.

g. Delays
Electrical

Date	Shift	Duration	Loss In Product	Cause
June 18th	Night	2 hours	210 tons)	Cage hoist electrical cable
June 19th	Night	4 hours	340 tons)	burned out due to cinders used for filling around cage and skip foundations catching fire from an overheated air line passing through them. A fire in the compressor due to the formation of carbon caused the air line to heat up.
June 25th	Night	1 hour	147 tons	Lack of current.
Sept 10th	Day & Night	21 hours	320 tons	Lightning blew out coils on motor generator set operating underground haulage and scraper hoists.
Sept. 11th	Day	2½ hours	100 tons	Lack of current.

Delays
Non-electrical

July 3rd	Day	2 hours	210 tons	Skip roller and shaft runner broken.

MAAS MINE
ANNUAL REPORT
YEAR 1936

g. Delays
Non-electrical (Cont.)

Date	Shift	Duration	Loss in Product	Cause
July 20th	Day	2 hours	200 tons	Angle iron on skip dump broken.
Nov. 11th	Day & Night	15 hours	1600 tons	At 5:00 P. M. the South Skip was pulled into the
Nov. 12th	Day & Night	24 hours	2200 tons	dump where it wedged, causing the rope to break. Fortunately the skip was

wedged so tightly that it did not fall down the shaft and cause more trouble, but it had to be cut apart with a torch before it could be removed and then several of the shaft members were found to be bent and had to be removed and straightened. It was 8:00 A. M., November 13th before operations could be resumed.

3. ANALYSIS

a. Average Mine Analysis on Output

Grade	1936 Iron	1936 Phos.	1936 Sil.	1935 Iron	1935 Phos.	1935 Sil.
Maas Bessemer	63.14	.043	5.53	63.02	.040	5.80
Maas	61.52	.073	6.67	61.23	.072	6.65
Race Course Bessemer	63.08	.042	5.71	63.06	.039	5.75
Race Course	61.55	.071	6.76	61.48	.068	6.55
Maas Special	58.81	.087	8.39	63.51	.082	3.96

b. Average Mine Analysis on Ore Shipped

Grade	Tons	Iron	Phos.	Sil.	Alum.	Mang.	Lime	Mag.	Sul.	Loss	Moist.
Maas & Race Course Bess.		63.05	.043	5.64	2.21	.22	.38	.15	.013	1.10	11.50
Maas & Race Course Non-Bessemer		61.25	.036	7.00	2.32	.22	.73	.18	.013	1.80	11.50

c. Average Analysis on Straight Cargoes

Grade	Mine Iron	Mine Phos.	Mine Silica	Lake Erie Iron	Lake Erie Phos.	Lake Erie Moist.
Lake Bessemer (Maas & Race Course Bessemer)	63.12	.043	5.57	63.17	.042	11.17
Maas (Maas Bessemer)	60.92	.081	7.25	60.94	.080	11.90

MAAS MINE
ANNUAL REPORT
YEAR 1936

e. Average Analysis of Ore in Stockpile

Average Natural Analysis

Grade	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moist
Maas Bessemer	55.94	.038	5.26	.19	2.00	.39	.16	.011	.89	11.24
Race Course Bess.	55.91	.037	5.60	.19	2.08	.75	.22	.011	.89	11.21
Maas	54.74	.065	6.04	.20	2.11	.74	.18	.011	1.56	11.21
Race Course	54.41	.058	6.31	.19	2.33	.77	.24	.011	1.77	11.39

4. ESTIMATE OF ORE RESERVES

a. Developed Ore

Assumption: 12 Cu. Ft. equals one ton.
10% deduction for rock.
10% deduction for loss in mining.

Location	Maas Lease Tons	Race Course Tons	Total Tons
Above 3rd Level	949,114	115,094	1,064,208
Between 3rd & 4th Levels	2,815,683	211,774	3,027,457
Between 4th & 5th Levels	1,834,193	1,199,420	3,033,613
Total above 5th Level	5,598,990	1,526,288	7,125,278
D.S.S. & A. Strip (Adams)			
Total Maas Group			

10% of total tonnage of Maas and Race Course is estimated to be Bessemer grade, 712,528

The estimate of ore reserves as of December 31, 1936, shows a decrease of 14,731 tons over the estimate of December 31, 1935. When the production for 1936 is taken into consideration, the estimate shows an increase of 514,869 tons of developed ore, distributed as follows:

NEW ORE RESERVES DEVELOPED IN 1936

	Maas	Race Course	Total
Above 3rd Level	15,467	67,041	32,508
3rd to 4th Levels	43,122	15,481	58,603
4th to 5th Levels	171,332	202,426	373,758
Total	229,921	284,948	514,869

The principle increase was in the area from the Fourth to the Fifth Levels and was due to development to the West under the hanging on the Fourth Level and subs below; also to the development on the Fifth Level, North of the dike, both in the Race Course lease and Maas Fee where there was an increase in the ore area.