

LLOYD MINE  
ANNUAL REPORT  
YEAR 1945

2. PRODUCTION, SHIPMENTS  
AND INVENTORIES (Cont.)

e. Production by Months

Month	Days	Lloyddale Ore Tons	Lloyd Silica Tons	Total Ore Tons	Rock Tons	Tons per Man per Day
January	22 $\frac{1}{2}$	21,023	5,632	26,655	76	5.11
February	24	20,067	5,661	25,728	1,042	5.28
March	27	21,663	7,753	29,416	332	5.38
April	25	19,636	6,611	26,247	601	5.24
May	26	21,168	7,950	29,118	914	5.40
June	26	24,801	6,847	31,648	1,009	5.89
July	25	15,894	8,305	24,199	360	4.59
August	25	17,893	7,077	24,970	52	5.23
September	24	17,760	5,065	22,825	494	4.68
October	27	21,775	8,672	30,447	2,413	5.78
November	25	17,728	8,693	26,421	2,079	5.79
December	23	18,448	5,569	24,017	3,054	5.43
Total	299 $\frac{1}{2}$	237,856	83,835	321,691	12,426	5.40
Transfers		1,475	1,475			
		239,331	82,360	321,691	12,426	
Current Year Stockpile Over-run		4,942		4,942		
Grand Total		244,273	82,360	326,633	12,426	

f. Ore Statement

	Lloyddale Tons	Lloyd Silica Tons	Total Tons	Total Last Year
On Hand January 1, 1945	16,996	202,705	219,701	119,887
Output for Year	237,856	83,835	321,691	376,405
Transfers	1,475	1,475		
Over-runs	4,942			
Total	261,269	285,065	546,334	496,750
Shipments	238,045	101,423	339,468	277,049
Balance on Hand	23,224	183,642	206,866	219,701
Decrease in Output			50,230	
Increase in Shipments			62,419	
Decrease in Ore on Hand			12,835	

The operating schedule for the past five years follows:

- 1941 3-8 hr. shifts 5 days per week Jan. 1 to Jan. 24, 3 crews. 3-8 hr. shifts 5-1/2 days per week Jan. 25 to Aug. 31, 3 crews. 3-8 hr. shifts 5-2/3 days per week Sept. 1 to Dec. 31, 3 crews.
- 1942 3-8 hr shifts 5-2/3 days per week Jan. 1 to Dec. 31, 3 crews.
- 1943 3-8 hr. shifts 5-2/3 days per week Jan. 1, to Feb. 1, 1943. 3-8 hr. shifts 5-1/3 days per week Feb. 1 to Dec. 31, 1943.



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f. Ore Statement (Cont'd)

1944 3-8 hr. shifts 5-1/3 days per week January 1, to July 1, 1944. Effective July 1, 1944, three shifts per day, 5 days per week, and effective October 30th, hoisting on two shift schedule.

1945 2-8 hr. shifts hoisting and 3-8 hr shifts mining, 5 days per week, January 1st to January 27th. Effective January 27th, 2-8 hr shifts hoisting and 3-8 hr. shifts mining, 6 days per week to December 31, 1945.

g. Delays

There were three delays of consequence to operations during the year that resulted in some loss in product. In the case of one of the delays the loss in product was so small that it was possible to make up this loss on the following shifts.

During the day shift operation on August 3rd, a one hour delay to hoisting occurred when it became necessary to repair some broken casing between the cage and skip road compartments. The estimated loss in product on this account was 60 tons but most of this loss was recovered on the following shifts.

During the day shift operation on August 21st, a two hour delay to hoisting occurred due to a short-circuit in a coil of the skip hoist motor. The estimated loss in production on this account was 200 tons.

During the day shift operation on September 29th, a three hour delay to hoisting occurred, due again to a short-circuit in a coil of the skip hoist motor. The estimated loss in production on this account was 200 tons.

3. ANALYSIS

a. Average Mine Analysis on Output

<u>Grade</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>
Lloyddale	244,273	59.49	.138	8.19
Lloyd Silica	82,360	53.75	.123	17.06

b. Analysis of Ore in Stock December 31, 1945

<u>Grade</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss</u>	<u>Moist</u>
Lloyddale Dried	23,224	58.86	.128	9.71	.25	2.19	.60	.39	.012	3.04	
Lloyddale Nat'l.		52.23	.114	8.62	.22	1.94	.53	.35	.011	2.70	11.26
Lloyd Sil.Dried	183,642	53.28	.118	16.91	.23	2.34	.59	.34	.010	3.01	
Lloyd Sil.Nat'l.		47.66	.106	15.13	.21	2.09	.53	.30	.009	2.69	10.54



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3. ANALYSIS (Cont.)

c. Complete Analysis of Ores Shipped

	<u>Grade</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss</u>
Lloyddale		238,045	59.40	.149	7.95	.25	2.19	.60	.39	.012	3.04
Lloyd Silica		101,423	53.20	.121	17.27	.24	2.34	.59	.33	.010	3.01

d. Complete Analysis of Straight Cargoes

	<u>Grade</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>
Lloyd Silica		12,274	53.09	.117	17.60

4. ESTIMATE OF  
ORE RESERVES

a. Developed Ore

The following is an estimate of ore reserves made as of December 31, 1945 using a factor of 12 Cubic feet per ton.

	<u>No. 1 Deposit</u>	<u>No. 2 Deposit</u>	<u>Total Tons</u>
Above 7th Level	91,402		91,402
Between 7th & 8th Levels	482,618		482,618
Above 210' Sub Level		58,971	58,971
Below 8th Level	228,889		228,889
Below 210' Sub Level		98,750	98,750
<u>Total Gross as of November 30, 1945</u>	<u>802,909</u>	<u>157,721</u>	<u>960,630</u>
<u>Less December Production</u>	<u>18,448</u>		<u>18,448</u>
<u>Total Gross as of December 31, 1945</u>	<u>784,461</u>	<u>157,721</u>	<u>942,182</u>
<u>Less 10% for Mining &amp; Rock</u>	<u>80,291</u>	<u>15,772</u>	<u>96,063</u>
<u>Total Developed Reserve</u>	<u>704,170</u>	<u>141,949</u>	<u>846,119</u>

The following table shows a comparison of developed ore during the past three years:

	<u>1943</u>	<u>1944</u>	<u>1945</u>
Reserves on January 1st.	662,641	707,170	726,938
Production	288,412	248,064	244,273
Balance	374,229	459,106	482,665
Reserves on December 31st.	707,170	726,938	846,119
New Ore Developed	332,941	267,832	363,454

For the third consecutive year, exploration and development has proven additional reserves. The entire amount of indicated developed ore is not actual due to a change in the method of calculating the total reserves. In previous years a deduction of 10% for loss in mining and also 10% for rock was made from the gross tons in arriving at the total estimated reserves. This deduction has never been allowed by the State Tax Commission in cases where the orebody is well developed so this year for the first time a total deduction of 10% loss for both mining and rock was made. This change accounts for a larger tonnage of new ore developed than actual by about 60,000 tons. However, a substantial



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4. ESTIMATE OF  
ORE RESERVES (Cont.)

a. Developed Ore (Cont.)

tonnage of new ore has been developed most of which is represented in the new find and designated as No. 2 deposit south of the main orebody and dike. The balance of the increase is due to a larger area being used for estimating purposes on the 8th Level. Main level drifting and exploration drilling has outlined an area slightly larger than previously assumed on this level and this has resulted in increasing the tonnage both above and below the level.

Several additional holes that were drilled to explore the extent of the main orebody below the 8th Level proved ore extending to a lower depth than previously assumed. Converging of the north and south footwalls in depth continues to reduce the lateral extent of the ore and as a result the width of the main orebody at the 9th Level elevation will, according to present information, be less than 20'. The length along the strike decreases rapidly in depth also due to convergence of the fault along the west side of the deposit and the crotch at the east end. The newly developed ore therefore is again represented mainly in a vertical extension of the orebody and the bulk of it, including the deposit south of the dike, is below the 8th Level and will be mineable from the proposed 9th Level.

b. Estimated Analysis of Ore Reserves

<u>Grade</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sul.</u>	<u>Loss</u>	<u>Moist</u>
Lloyddale Dried	58.80	.144	8.50	.215	2.32	.68	.34	.017	3.17	
Lloyddale Nat'l.	51.89	.127	7.50	.19	2.05	.60	.30	.015	2.80	11.75

The above analysis applies to Lloyddale grade only as the reserves of Silica grade are not estimated.

5. LABOR AND WAGES

a. General

Relations with the employees and their general attitude has not been entirely satisfactory during the year. Grievances have been adjusted on the basis of the contract with the union and a number of meetings have been held with the Grievance Committee for the purpose of presenting complaints. In nearly each case these were settled in "Step 1" of the procedure and were not carried farther. One written grievance was submitted and in "Steps 1 and 2" of the procedure the request was denied but it was carried into "Step 3" and it was settled on the basis of a compromise. By the end of the year, membership in the union was about 100% of the employees and as a consequence their position has been strengthened considerably. Hope for improvement in relations in the future is dependent upon the type and calibre of men they will elect as representatives.

On November 28th the union held a strike vote throughout the industry to support their demand for a two dollar a day increase in wages. Approximately 70% of the employees at the mine cast their votes for a majority of six to one in favor of the strike action. The average throughout the industry was about five to one in favor of the strike, the date of which was set for January 14, 1946. Later the date of the strike was postponed to February 7, 1946.



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5. LABOR AND WAGES (Cont.)

a. General (Cont.)

There was a total of 227 men on the payroll at the end of the year as compared with 228 a year ago. The labor turn-over was not nearly as severe as in the previous year when a large number of employees of draft age were called into the service and also many quit. There was a total of 22 men who left our employ and 21 were hired resulting in a net decrease of one man. During the year, nine employees quit to seek work elsewhere and 10 were retired. Most of the retirements were made during the latter part of the year after the labor force was built to normal strength by hiring and also as a result of the reduction in the size of the underground operation. There were two men transferred to other mines and only one man was drafted into the service. At the end of the year the working force was about normal for the size of the operation and it is apparent that no increase in the number will be required during the remaining years of the life of the mine. After a year or more a gradual reduction in the labor force will have to be made to keep it in line with the reduced size of the underground operation.

b. Comparative Statement of Wages & Product

	<u>1 9 4 5</u>	<u>1 9 4 4</u>	<u>Incr.</u>	<u>Decr.</u>
Product	<u>326,633</u>	<u>376,863</u>		50,230
No. of Shifts & Hours				
Jan. 1 to Jan. 27		3-8 Hr. Mining, (5 Days Per Week) 2-8 Hr. Hoisting, (5 Days Per Week)		
Jan. 27 to Dec. 31		3-8 Hr. Mining, (6 Days Per Week) 2-8 Hr. Hoisting, (6 Days Per Week)		
Jan. 1 to July 1			3-8 Hr. (5-1/3 Days Per Week)	
July 1 to Oct. 31			3-8 Hr. (5 Days Per Week)	
Oct. 31 to Dec. 31			2-8 Hr. Hoisting, (5 Days Per Week) 3-8 Hr. Mining, (5 Days Per Week)	

AVERAGE NO. OF MEN WORKING

Surface	53	63	10
Underground	152	205	53
Total	<u>205</u>	<u>268</u>	<u>63</u>

AVERAGES WAGES PER DAY

Surface	7.63	7.06	.57
Underground	8.86	7.99	.87
Total	<u>8.54</u>	<u>7.66</u>	<u>.88</u>

The following table shows a comparison of the average wages per day for surface and underground for the past five years:

<u>YEAR</u>	<u>SURFACE</u>	<u>UNDERGROUND</u>
1941	6.51	7.42
1942	6.74	7.85
1943	7.15	8.10
1944	7.06	7.99
1945	7.63	8.86



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5. WAGES & LABOR (Cont.)b. Comparative Statement of Wages & Product (Cont.)

<u>WAGES PER MONTH OF 24 DAYS</u>	<u>1945</u>	<u>1944</u>	<u>Incr.</u>	<u>Decr.</u>
Surface	183.12	169.44	13.68	
Underground	212.64	191.76	20.88	
Total	204.96	186.24	18.72	

WAGES PER MONTH OF 22 DAYS

Surface	167.86	155.32	12.54	
Underground	194.92	175.78	19.14	
Total	187.88	170.72	17.16	

PRODUCT PER MAN PER DAY

Surface	20.69	21.42		.73
Underground	7.30	6.86	.44	
Total	5.40	5.19	.21	

LABOR COST PER TON

Surface	.369	.329	.040	
Underground	1.213	1.166	.047	
Total	1.582	1.495	.087	

AVERAGE PRODUCT STOPPING

20.86	19.19	1.67
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AVERAGE WAGES CONTRACT MINERS

9.05	8.35	.70
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TOTAL NUMBER OF DAYS

Surface	15,786 $\frac{1}{2}$	17,590 $\frac{3}{4}$	1,804 $\frac{1}{2}$
Underground	44,725 $\frac{1}{2}$	54,945	10,219 $\frac{1}{2}$
Total	60,511 $\frac{1}{2}$	72,535 $\frac{1}{4}$	12,024

AMOUNT OF LABOR

Surface	120,493.57	124,138.08	3,644.51
Underground	396,224.32	439,090.12	42,865.80
Total	516,717.89	563,228.20	46,510.31

PROPORTION OF SURFACE TO UNDERGROUND MEN

1941 - 1 to 4.25  
 1942 - 1 to 3.90  
 1943 - 1 to 3.40  
 1944 - 1 to 3.24  
 1945 - 1 to 2.88



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6. SURFACE

a. Buildings

There was very little construction and no additions to existing buildings erected during the year. To maintain the surface buildings in good condition only minor repairs were necessary.

Within the building near the shaft that is used as a check-room for underground employees a room about 10' x 10' in size was constructed to serve as a first aid room. A portion of the interior of the building was partitioned off for this room. A wash basin was installed and the room was furnished with the necessary tables and cabinets for first aid supplies. The interior was lined with galvanized sheet metal and painted a two-tone color.

Another minor change made inside the check-room building consisted of erecting a brick chimney on the south side and the small stove that is used for heating the building was moved to make room for the first aid room. A small coal storage bin was also constructed in one corner of the room.

In the dry house some changes were made in a portion of the room that is used for underground clothes storage. Several years ago when a larger number of men were employed, a temporary extension was constructed at the north end of the room, utilizing a portion of the carpenter shop. Due to a decrease in the number of men since that time the extension was no longer needed and it was removed, restoring the carpenter shop to its original size.

The interior of the warehouse, including the shelves, was painted a two-tone color and the floor was also given a coat of tile floor enamel.

It will be necessary in the near future to paint the exterior of the combined office, dry house and shop building. The building was erected in 1936 and has not been painted since that time. The aluminum paint on the exterior has peeled badly in places allowing the metal sheeting to rust in these spots. Two coats of paint will be required on all the exterior parts of the building to put it in good condition.

b. Stocking Grounds

At the close of the shipping season only a small amount of Lloydale grade ore was left in stock in the area east of the shaft. In spite of the increased shipments of Silica grade a relatively large inventory of this grade of ore still remains in stock in three separate areas; one stockpile directly east of the shaft, another to the north of the shaft and a smaller amount in the stocking area to the west of the shaft. All the shipments of Silica grade from the stockpile were made from the relatively large pile of this grade directly east of the shaft. The Lloydale grade was stocked on three separate trestles which roughly parallel each other to the east of the shaft. The most southerly pile of this grade was completely cleaned out before the close of the shipping season and unlike other years, no stocking trestle has been erected in this area because sufficient capacity for this grade is provided by the two trestles in the area to the north.



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6. SURFACE (Cont.)

b. Stocking Grounds

Before the close of the shipping season a total of 15 bents of wood trestle were erected to the east of the shaft for stocking both Lloyddale and Silica grades and 13 bents of wood trestle were erected for stocking Lloyddale grade only in the north half of the area. To provide additional capacity for stocking Silica grade during the winter months, five bents of wood trestle were erected as an extension to the trestle west of the shaft.

Similarly as in other years, before the start of the shipping season, the Lloyddale grade piles were blasted for their entire length by means of holes put down from the crest of the pile. This practise has helped considerably in hastening the thawing of the frozen piles and consequently speeds the shovel loading operations.

c. Shaft House

During the past year, since a larger portion of the product has been hoisted from the 8th Level, excessive wear on the south skip rope became noticeable. This was due to the increase in the fleet angle when hoisting from depth increased. To correct this condition and reduce the rope wear the head sheaves on top of the shaft house were shifted in alignment. This work was done by a crew of steel workers over a weekend period in August. The south head sheave, in addition to being shifted in position, was installed on a steel pedestal about 5' in height. The north head sheave was shifted only slightly as the alignment, in this case, has not materially effected the wear on the rope. In addition to the changes made in the alignment of the sheaves, it was necessary to construct extensions on each of the two pulley stands. New 2" fir decking was installed on the platforms of each of the pulley stands replacing rotted decking and also new guard railing was installed. No delay to operations occurred while this work was underway but it was necessary to employ the crew of steel workers on a 3-8 hour schedule over the weekend period to complete the work.

d. Roads

To maintain the roads in and about the mine surface plant and also the parking lot in good condition, only a small amount of grading was necessary and an occasional load of mine rock hauled for filling. During the winter months the tractor-bull-dozer was used extensively in clearing the roads of snow. This unit has become indispensable for this purpose as it requires only several hours to clear the roads of snow after each heavy snow fall.

7. UNDERGROUND

a. Shaft Sinking

There was no shaft sinking in 1945.



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7. UNDERGROUND (Cont.)

b. Development

The development program throughout the year was not as large as in the previous year due to completion of the major portion of development on the 8th Level. Most of the development work was for sub level stopes between the 7th and 8th Levels and main level development was confined mostly on the 8th Level. Two short crosscuts were driven on the latter level, branching to the south to develop the new orebody for mining.

Mining is rapidly progressing to lower elevations and only in the easterly portion of the deposit is mining still being conducted above the 7th Level, and as a result very little development work was required on the 7th Level and above. At the east end of the deposit a small stope was developed a short distance above the 7th Level and operations were completed here early in the year. Development for a scam stope was then continued in the same area below the 7th Level and operations were completed here before the end of the year. A short drift connection in rock for ventilation purposes and a small amount of development for a scam stope in one of the slicing areas consisted of the balance of the development conducted above the 7th Level. As mining in additional areas above the 7th Level approached the level elevation, it became necessary to drive a short drift connection to complete No. 760 crosscut to the south footwall drift so tramming operations could be continued on the 7th Level from three contracts mining at the east end.

Between the 7th and 8th Levels, most of the development was in connection with sub level stope operations and by the end of the year development was completed for three stopes in the orebody south of the main deposit and dike. In the main orebody, in addition to two scam stopes, one at the east end and the other near the west end, a third larger stope was developed in the central part of the orebody. By far, most of the stope development between the 7th and 8th Levels was in the new orebody south of the dike. Three separate transfer drifts were driven along the strike in ore and jasper and a number of mill raises put up to the top of the ore. Intermediate sub level drifts were driven connecting the mills and some exploration drifting was also done on various sub levels to outline the orebody. In the case of the scam stopes in the main orebody, short transfer drifts were driven and only a small amount of development was required above the transfers. The stope in the central part of the main orebody was partially developed in the previous year but several additional mills were put up and intermediate sub level connections driven before mining could be started.

On the 8th Level an extension was driven to the south from the end of the short southeast crosscut driven in the previous year. Later, a second crosscut was driven to the southeast for the purpose of developing for mining the orebody south of the main deposit and dike. The first crosscut to the south disclosed a width of about 30' of ore lying adjacent to the slate footwall and the second crosscut disclosed a more favorable width. Subsequent stope development has outlined the orebody a short distance above the 8th Level elevation, showing an average width of about 20' and about 400' in length along the strike. At the west end the ore does not extend above the 8th Level and it rises in height to a maximum of 85' above the level at the extreme east end.

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7. UNDERGROUND (Cont.)

b. Development (Cont.)

Two additional raises were put up in the main orebody from the 8th to the 7th Levels. At the end of the year both of the raises were serving mining contracts that were carrying on operations in an area above the 7th Level. A third raise was put up from the south crosscut in the main orebody to a sub level 40' above the level. The latter raise was used during the life of the stope that was developed in the central part of the deposit.

Late in the year work was started on the development of a 9th Level under E & A CC-159. The preliminary work will consist of driving about 400' of rock drift and excavating a plat adjacent to the winze site in the footwall slate west of the westerly limits of the orebody on the 8th Level. The winze will then be sunk to a depth of 200' below the 8th Level to provide an interval of 200' between the 8th and 9th Levels. The development on the 9th Level will comprise driving about 1000' of rock drift to the east for the main Level haulage drift and three crosscuts will be driven branching to the south.

The winze will be divided into a cage and ladder compartment. No skip compartments will be provided because the loaded tram cars will be hoisted on the cage from the 9th to the 8th Level and similarly the empty cars and trucks of timber will be lowered from the 8th Level.

By the end of the year 325' of rock drift had been completed on the 8th Level branching to the east from the main haulage drift. About 260' of the drift was stripped to double width extending to the east and west of the winze site to provide room for installing double tracks. Before sinking operations are started a hoist room will be excavated and a large size raise will be put up to a height of 30' directly above the winze to provide room for the timber structure that will support the head sheaves. Work will be concentrated on this development project throughout the coming year and it will be necessary to rush this work so uninterrupted mining can be continued in the rapidly depleting orebody.

c. Stoping

Mining operations in 1945 have been confined almost entirely to the Lloyd East Deposit and for the first time the bulk of the product was obtained from areas between the 7th and 8th Levels. In the latter months of the year, one small stope operation was underway in the new orebody south of the main deposit and dike and development was nearing completion at the end of the year for two additional stopes. The product mined from the new orebody was very small because the work was mostly development during the year. Production from stope operations has continued to decrease due to the lack of areas that can be developed for this system of mining. There is a good possibility however that one and possibly two productive stopes can be developed in the new orebody above the 8th Level. The tonnage of ore that has been outlined above the 8th Level indicates a relatively short life to the stopes and unless ore extensions occur that presently are unknown, about five or six months of operations in 1946 will deplete the ore above the 8th Level. The productive capacity of the mine is gradually being reduced due to the decrease in the lateral extent of the main orebody as mining increases in depth. Another factor that reduces the extent of the ore in many areas is the persistent inclusions of jasper within the ore. In many cases the jasper is too poor in quality to be mined as Silica grade, and consequently is left in place.



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7. UNDERGROUND (Cont.)

c. Stoping (Cont.)

By the end of the year mining operations at the east end of the orebody had reached a top elevation of 50' above the 7th Level. Three contracts were carrying on operations here and the product was being trammed on the 7th Level. In the central part of the deposit and extending to the westerly limits, most of the mining has been carried on from raises put up from the 8th Level. By the end of the year, operations in the westerly half of the main orebody were being conducted on various elevations ranging from the 7th Level down to the 260' sub level. The latter elevation being the lowest to which slicing operations have progressed.

A modified method of drilling blast holes was employed in the small stope developed in the central part of the orebody. The ore in this area was too soft to carry benches in the conventional manner along one face of the stope. By means of sectional steel and couplings, holes up to 20' and more in length were drilled radially near the face of the stope on each intermediate sub level. In this case an average of seven holes were drilled and blasted simultaneously. Successful results were obtained and application of this system was made in several other instances in subsequent stope operations. In addition to providing more safety in stope mining, the system resulted in a higher rate of production.

Mining operations and development work have been conducted on a total of 16 different sub levels, seven of which were above the 7th Level and nine above the 8th Level. The following is a detailed description of the mining operations on the various sub levels.

Subs Above the 7th Level - Main Deposit

415' Sub Level

Early in the year three contracts completed slicing operations in a pillar near the east end of the orebody. An area about 140' x 90' was mined from No. 710 and No. 712 raises with two contracts being employed at the latter raise.

400' Sub Level

An average of six contracts carried on mining operations at this elevation during the year in the easterly half of the deposit. With the exception of a small scam stope above a slicing area at the east end, the balance of the mining was by top slicing. An area 320' x 80' was mined from a series of six raises from the south footwall drift. At both the east and west limits the slices extended to old workings and in the north and south direction, the slices extended to the slate footwall and dike respectively. An area of lean ore and jasper occurs along the dike in this area and when slicing in this direction most of the product was Silica grade. A dike which averages about 2' in width cuts diagonally through the ore area and when slicing through or adjacent to it, the grade of the ore was lowered to such an extent that, in most cases, it was hoisted for Silica grade.

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7. UNDERGROUND (Cont.)

390' Sub Level

Three contracts completed slicing operations in two separate areas in the easterly half of the deposit early in the year. Several slices were mined by one contract to the west of No. 707 raise to complete the mining in this area. Farther to the east a considerably larger area of Lloyddale grade was mined by two contracts working from No. 715 and No. 718 raises. The slices were advanced east to a mined area and to a jasper mass within the ore and to the west extended to an established mining limit. Along the north side the slices extended to the jasper and slate footwall and to the south to the diabase dike.

Three contracts were carrying on slicing operations near the east end at the end of the year. One contract was slicing to the southeast of No. 710 raise with slices that extended to the dike. Two contracts were working from No. 712 raise, one of which was slicing to the dike southeast of the raise and the other started to mine to the north towards the slate footwall. An area of Lloyddale grade about 160' x 90' is being mined near the east end by these three contracts and 40% of this area was mined by the end of the year.

375' Sub Level

Five contracts carried on mining operations at this elevation during the year, four of which were slicing and one stoping. In a large portion of the west half of the orebody four contracts mined an area of Lloyddale grade 380' x 60' from a series of five raises from the south footwall drift. At the west end the slices extended to a mined area and jasper hanging and at the east end to a mining limit. A large amount of Silica grade was mined by one of the slicing contracts at the west end where the slices extended to the jasper hanging. The extent of the ore on this sub level was much smaller than on the sub level above due to convergence of the north and south footwalls.

In the narrow crotch at the east end an area 120' x 40' was mined by a scam stope operation similarly as on the sub level above. During the initial stages of the stope mostly Lloyddale grade was mined but after caving from the back started a large amount of Silica grade was mined. By far the bulk of the product during the life of this scam stope was Silica grade.

360' Sub Level

Two contracts completed operations at this elevation before the end of the year. One of the contracts mined an area about 120' x 60' by slicing in the central part of the orebody. To the south and adjacent to the above area, a smaller area was mined by stope operations which induced caving that extended to this sub level. In the narrow crotch of ore at the east end an area 100' x 35' was mined by the scam stope operation similarly as on the sub level above.

At the end of the year two contracts were carrying on slicing operations at this elevation from the two 8th Level raises, No. 815 and No. 817, the latter of which was completed to this elevation in December. Similarly as on sub levels above, the two contracts were slicing an area of Lloyddale grade that was bounded on the west by a mined area and on the east by a mining limit.



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7. UNDERGROUND (Cont.)

350' Sub Level

Three contracts completed mining an area about 220' x 40' in the central part of the orebody. At the west end an area about 40' x 30' was mined by a scam stope that was developed from a slicing area at a lower elevation. To the east and adjacent to the scam stope, an area about 70' x 40' of Lloyddale grade was mined by stoping from a lower elevation which induced a cave that extended to this sub level. One contract slicing from No. 811 raise mined a large area that extended west to jasper hanging and stopes and east to a mining limit.

7th Level

A total of five contracts carried on mining operations at this elevation during the year. Three of the contracts were slicing and two carried on scam stope operations. At the west end of the orebody a small triangular pillar of Lloyddale grade was recovered by slicing operations from No. 802 raise. To the east of this raise an area 50' x 30' of Silica grade was mined by a scam stope that was developed from a slicing area at a lower elevation. Near the central part of the ore area a contract advanced two short slices to the east of No. 809 raise to complete recovery of a small pillar. Adjacent to the latter area and to the east, an area about 110' x 70' of Lloyddale grade was mined by slices that radiated from No. 811 raise and also a stope operation along the south footwall side. Late in December the slicing contract was making preparations to move down and develop the next lower sub level.

At the east end a small triangular area was mined by a scam stope operation that was developed from a transfer above the 8th Level. Similarly as on sub levels above, Lloyddale grade was mined until caving from old stopes above started and then a substantial amount of Silica grade was recovered.

Subs Above the 8th Level

325' Sub Level

An average of eight contracts carried on slicing and stope operations at this elevation during the year. At the west end of the orebody a relatively large triangular area was mined by two contracts slicing from No. 802 raise. The slices were advanced west to the fault which limits the ore in this direction and along the east side to the jasper hanging. One of the contracts, in addition to carrying on slicing operations, mined by a scam stope, an area of Silica grade about 60' x 40' to the east of the slicing area. Some Silica grade was also mined while advancing several slices to enable recovery of Lloyddale grade.

In the west half of the orebody along the south footwall side, an area 180' x 80' was mined by three contracts slicing from No. 805 and No. 807 raises. Two of the contracts were employed at the latter raise and one at the former. Some Silica grade was mined in the slices advanced to the north of the raises where a mass of lean ore and jasper occurs. The extension of the lean ore and jasper area to lower elevations has resulted in reducing considerably the extent of the standard grade ore in the west half of the orebody.

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7. UNDERGROUND (Cont.)

Subs Above the 8th Level (Cont.)

325' Sub Level (Cont.)

Farther to the east and adjacent to the latter area one contract mining from No. 809 raise completed slicing an area about 120' x 30'. The extent of the ore here is rapidly becoming smaller as lower elevations are reached and on this account, slicing operations were abandoned and the balance of the ore will be recovered by a scam stope operation. Near the central part of the orebody an area about 60' x 30' of Lloydale grade was mined by stope operations similarly as on several sub levels above. At the east end of the deposit a small triangular area was mined by a scam stope operation early in the year.

315' Sub Level

Eight contracts completed mining operations at this elevation in the main orebody during the year and late in December another contract was starting operations at this elevation in the orebody south of the dike. This is the highest elevation to which development in the orebody south of the dike extended to reach the top of the ore. In December stope operations were started from the most easterly mill and by the end of the year an area 40' x 20' of Lloydale grade had been mined.

In the main orebody a relatively large triangular area was mined by two contracts slicing from No. 802 raise. Similarly as on subs above the slices extended west to the fault which defines the limits of the ore in this direction and to the east the slices extended to the jasper hanging. This ore area is decreasing rapidly in size as lower elevations are reached due to convergence of the fault and north footwall and also due to the inclusion of a large mass of jasper in the orebody. An area about 200' x 60' of Lloydale grade was mined by slicing operations conducted from No. 807 and No. 809 raises. Three contracts continued slicing in this area similarly as on subs above.

An area about 80' x 30' was mined by stoping in the central part of the deposit along the south footwall dike. A narrow wing to the stope was also mined to the north following a narrow seam of concentration. At the east end, by means of the scam stope, an area about 60' x 30' of Lloydale grade was mined. In addition to the Lloydale grade a substantial amount of Silica ore was recovered during the last stages of the operation.

300' Sub Level

Five contracts completed mining operations at this elevation during the year and two contracts were mining in an area at the west end of the orebody at the end of the year. Working from No. 802 raise, one contract had completed slicing a large portion of the area to the south and west that extends to the fault and late in December slices were being advanced to the northwest towards the footwall. The second contract working from the same raise had completed three slices to the northeast to the footwall slate and in December two additional short slices were completed to a mined area. A large portion of the



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7. UNDERGROUND (Cont.)

Subs Above the 8th Level (Cont.)

300' Sub Level (Cont.)

latter contracts mining was in Silica grade ore as it was necessary to advance slices through this material to enable recovery of the Lloydale grade in this area. In the west half of the orebody four contracts completed slicing operations along the south footwall dike from No. 805, No. 807 and No. 809 raises. Mostly Silica grade ore was mined in the slices to the north of the raises, and as mentioned previously, a mass of lean ore and jasper within the orebody materially reduces the extent of the standard grade ore in this area.

In the central part of the orebody an area about 110' x 25' was mined by the stope operation similarly as on subs above. The westerly portion of the stope at this elevation was developed in Siliceous ore and a substantial amount of this grade was mined as the stope was retreated to its west limits.

285' Sub Level

Four contracts completed mining at this elevation in the main orebody and late in the year a fifth contract did a small amount of stoping at this elevation in the orebody south of the dike. At the start of stope operations in the orebody south of the dike the most easterly mill was enlarged to about 30' x 30' in Lloydale grade.

In the main orebody three contracts slicing from No. 805 and No. 807 raises mined an area 170' x 80'. Two contracts worked from No. 807 raise and one from No. 805 and slices were advanced to the ore limits radiating about each of the raises. In the central part of the orebody an area about 100' x 30' was mined by the stope operation as on subs above.

275' Sub Level

Four contracts completed mining their respective areas in the main orebody and at the end of the year, one contract was carrying on stope operations in the orebody south of the dike. In the latter area the first stope was developed late in the year near the west end and an area about 50' x 30' was mined at this elevation. Stope operations here have been hindered considerably due to caving from the south footwall slate. Due to the very narrow width of the orebody, mining by top slicing is not adaptable to this area and in spite of the difficulties caused by slabbing from the footwall, recovery of the ore will be attempted by the stope method. Some of the ore will be left in place as pillars to provide support and reduce the caving action.

Three contracts completed slicing operations in the westerly half of the orebody from No. 805 and No. 807 raises. An area about 180' x 80' was mined by slices radiating about each of the raises. As on sub levels above, mostly Silica grade was mined in the slices to the north of the raises. In the central part of the deposit an area 110' x 25' of Lloydale grade was mined by stoping operations.

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7. UNDERGROUND (Cont.)

Subs Above the 8th Level

260' Sub Level

At the end of the year two contracts were slicing in the westerly part of the main orebody and two contracts were carrying on stope operations in the orebody south of the dike. At the east end of the orebody south of the dike, an area about 20' in diameter was stoped about the most easterly mill. At the west end of this area, a stope 80' x 30', most of which was Lloydale grade, was mined retreating to the east. Some of the development work in the latter area was in Silica grade and as stope operations advance, some Silica grade ore will also be mined.

The number of contracts working from No. 805 and No. 807 raises was reduced to two contracts on this sub level due to the reduction in the extent of the ore area. In December, one contract was slicing west with slices that extended to the fault from No. 805 raise and the other contract was advancing slices to the east to the jasper from No. 807 raise. This is the lowest elevation to which slicing operations have progressed within the main orebody and it will be possible to mine three more subs to reach the lower limit of mining from 8th Level raises. Subsequent mining will then be conducted from raises that will be put up from the 9th Level.

In the central part of the orebody, an area about 100' x 15' was mined by stope operations. This was the lowest sub level for the stope operation that extended to the 7th Level elevation and a short distance above. In spite of the small size of the stope, a high rate of production was obtained during its short life by employing the radial method of drilling long blast holes.

235' Sub Level

There were two contracts employed at this elevation at the end of the year, one in the main orebody on development work, and another stoping in the orebody south of the dike. An area about 45' in diameter was mined by stoping in the latter orebody. Up to the end of the year most of the product from this stope was Silica grade as most of the development also was in ore of this grade.

In the main orebody, a contract started driving a transfer drift to the southwest from No. 809 raise. A short transfer will be driven here as part of the development for a scam stope along the south footwall dike. Directly above, slicing operations were conducted on a number of sub levels but a gradual decrease in the extent of the ore made it uneconomical to mine except by a scam stope.

225' Sub Level

One contract was carrying on stope operations at this elevation in the orebody south of the dike. An area about 50' x 25' was mined by retreating to the east. There was no mining conducted below this elevation during the year and the development work on the 210' sub level and on the 8th Level has been described under "Development".



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7. UNDERGROUND (Cont.)

d. Timbering

There was a decrease in the amount of timber used as compared with the previous year and there were decreases in about the same proportion in the amount of lagging and poles used. The reduced consumption of these supplies is the result of a gradual decrease in the size of the underground operation. The cost per ton for these supplies varied only slightly as compared with 1944 as there was no change in the price of timber, poles and lagging until late in December. The substantial increase that was made in the price of these supplies late in December had very little effect on the cost per ton in 1945.

The need for extra large size timber is becoming less due to a smaller development program. However, the use of large size timber is continued in all the repair work on the main levels and on sub levels where heavy crushing occurs and strong support is needed. Hardwood poles are being used to a larger extent as they serve very satisfactorily for spiling and forepoles in mining areas. There was a substantial reduction in the amount of cribbing timber used due to the relatively few raises put up during the year as compared with 1944 when a large raising program was in effect. Hardwood cribbing timber is being used in relatively small amounts in the upper portion of long raises and wherever rotting and long life is not of importance.

The following is a comparative timber statement for the past two years:

	Lineal Feet	Avg. Price Per Foot	Amount 1945	Amount 1944
6" to 8" Cribbing Tbr.	35,510	.0578	2051.91	3923.41
8" to 10" Stull Tbr.	47,152	.0862	4066.66	4564.51
10" to 12" " "	51,616	.1086	5605.15	6219.93
12" to 14" " "	15,152	.1993	3019.69	3039.56
Total Timber 1945	149,430	.0986	14743.41	
Total Timber 1944	179,081	.0991		17747.41
	Per 100 Feet			
7' Lagging	822,221	1.520	12500.93	14566.17
9½ Poles	481,468	2.141	10309.51	12579.59
Total Poles & Lagging	1,303,689	1.749	22810.44	27145.76
Product - Tons			326,633	376,758
Feet of Timber per Ton of Ore			.457	.475
Feet of Lagging per Ton of Ore			2.517	2.533
Feet of Lagging per Foot of Timber			5.502	5.330
Cost per Ton for Timber			.0451	.0471
Cost per Ton for Lagging			.0383	.0387
Cost per Ton for Poles			.0316	.0334
Cost per Ton for all Timber			.1150	.1192
Equivalent Stull Timber to Board Measure			295,967	385,191
Feet of Board Measure per Ton of Ore			1.104	1.022

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7. UNDERGROUND (Cont.)

d. Timbering (Cont.)

The following table shows a comparison of total cost of timbering for the past five years:

<u>Year</u>	<u>Amount</u>	<u>Cost per Ton</u>
1945	37,553.85	.1150
1944	44,893.17	.1192
1943	44,830.23	.0907
1942	33,627.95	.0592
1941	29,187.91	.0523

e. Drifting and Raising

There was a large decrease in the development footage of all classifications as compared with the previous year due to a smaller development program. As in other years, development for sub level stopes accounts for the major part of the total footage.

<u>Year</u>	<u>Drifting</u>			<u>Ore</u>	<u>Raising</u>		<u>Grand Total</u>
	<u>Ore</u>	<u>Rock</u>	<u>Total</u>		<u>Rock</u>	<u>Total</u>	
1945	3844'	375'	4219'	2147'	127'	2274'	6493'
1944	5439'	899'	6338'	2757'	352'	3109'	9447'

The following table shows a comparison of the development footage excluding the small drift and raise development for sub-level stopes:

<u>Year</u>	<u>Drifting</u>			<u>Ore</u>	<u>Raising</u>		<u>Grand Total</u>
	<u>Ore</u>	<u>Rock</u>	<u>Total</u>		<u>Rock</u>	<u>Total</u>	
1945	740'	340'	1080'	379'	13'	392'	1472'
1944	1479'	662'	2159'	784'	79'	863'	3022'

Late in the year development of the 9th Level was started under E & A CC-159 and work on this project will comprise the major part of the development during the coming year. In addition to the footage indicated in the tables above, the following table shows the development completed to the end of the year under E & A CC-159.

	<u>Rock Drift</u>	<u>Total</u>
8th Level	303'	303'

f. Explosives, Drilling and Blasting

There was only a slight variation in the cost per ton for explosives as compared with the previous year. The fact that production is becoming dependent more and more upon top slicing operations, together with a decrease in the Silica grade production, accounts for a sharp increase in powder costs during the past two years as compared with prior years. Another factor that will affect powder costs in the future is a change in the character of the ore as lower elevations are reached. Development and mining at the lower elevations indicates softer ore as evidenced by the fact that in one case it could not be stoped in the conventional sub level manner due to caving. This was one reason why long hole radial drilling was employed in a small stope between the 7th and 8th Levels.



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7. UNDERGROUND (Cont.)

f. Explosives, Drilling and Blasting (Cont.)

As in previous years, Gelamite No. 1 powder has been used exclusively in the mining and some of the development. In the rock development for the 9th Level and in several other cases when developing in extremely hard rock, Gelatine 60% powder has been used. A small quantity of Herculite No. 4 powder was again used for blasting the frozen stockpiles before the start of the shipping season. Herculite powder is favored for this use due to its slow detonating velocity and it has given good results. In all the raise work, master fuse lighters have continued to be used with good results in preference to blasting electrically.

When employing the radial system of drilling long blast holes in stopes, Primacord was used to detonate the powder. This assured detonation of all the powder in the long holes, more so than if blasting was done with the conventional fuses and caps. Good results were obtained in the use of Primacord for this purpose and it was used in several other instances in other stopes.

The explosives statements are shown under the following headings:

<u>BREAKING ORE</u>	<u>Quantity Lbs.</u>	<u>Average Price</u>	<u>Amount 1945</u>	<u>Amount 1944</u>
Gelamite Powder No. 1	139,115	11.50 C	16,234.59	19,325.20
60% Gelatin	-	-	-	30.47
Herculite No. 4	550	10.00 C	55.00	80.00
Total Powder	139,665	21.50 C	16,289.59	19,435.67
No. 20 Connecting Wire	2		1.10	-
Fuse - Feet	542,740	5.15 M	2,796.44	3,164.96
No. 6 Blasting Caps	77,479	12.20 M	945.25	1,168.66
Electric Blasting Caps	25	-	2.74	8.21
Primacord	2,000	32.00 M	64.00	-
Tamping Bags	5,950	2.76 M	16.45	4.30
Fuse Lighters	13,100	6.73 M	88.20	96.03
Fuse Cartridges	1,500	2.00 M	30.02	70.56
Total Fuse, Caps, etc.,			3,944.20	4,512.72
Total Expense Breaking Ore			20,233.79	23,948.39
Product - Tons			326,633	376,578
Lbs Powder per Ton of Ore			.428	.449
Cost per Ton for Powder			.050	.052
Cost per Ton for Fuse, Caps, etc.			.012	.011
Cost per Ton for all Explosives			.062	.063

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7. UNDERGROUND (Cont.)

f. Explosives, Drilling and Blasting (Cont.)

<u>DEVELOPMENT IN ROCK*</u>	<u>QUANTITY</u> <u>Lbs</u>	<u>AVERAGE</u> <u>PRICE</u>	<u>AMOUNT</u> <u>1945</u>	<u>AMOUNT</u> <u>1944</u>
Gelamite Powder No. 1	5,145	11.50 C	334.60	613.22
60% Gelatin	-	-	-	495.42
Total Powder	5,145	11.50 C	334.60	1,108.64
Fuse - Feet	11,607	5.15 M	59.97	94.86
No. 6 Blasting Caps	1,707	12.20 M	20.84	31.40
Fuse Lighters	600	6.73 M	4.05	6.04
Tamptite Shells	95	7.90 C	7.50	-
Total Fuse, Caps, etc.			92.36	132.30
Total all Explosives			426.96	1,240.94
Rock Drifting, Feet			489'	1,021'
Cost per Foot for Powder			.684	1.085
Cost per Foot for Fuse, Caps, etc.			.1888	.129
Grand Total Explosives used in Mine			20,660.75	25,189.35
Cost per Ton all Explosives Used			.063	.067
Average Price per Lb. for Powder			.1075	.1149

\* Exclusive of work chargeable to Exploration, Ventilation and E & A's.

g. Ventilation

With several exceptions, ventilation conditions in the mine have been quite satisfactory during the year. The main ventilating fan on the 4th Level at Section 6 shaft has been in nearly continuous operation exhausting the air up Section 6 shaft during the summer months and during the freezing weather the direction of the flow of air was reversed to exhaust up the Lloyd shaft. By following this procedure no trouble has been experienced by ice formation in the hoisting shaft.

A decrease in the volume of air delivered by the fan became noticeable during the early part of the year and consideration was given at that time to increasing the speed to boost the output of the fan. However, according to the manufacturer's specifications this could not be done as the fan is already operating at its recommended maximum capacity. The drop in output of the fan is due to extension of the mine workings and this has resulted in increasing the resistance against which the fan is operating. It was found however, that some air was lost on the upper levels through old workings and apparently this air was reaching surface through the cave. To stop this loss of air several brattices were constructed on the 5th and 6th Levels to seal off the old workings from the main airways. Also, obstructions in two main ventilation raises between the 6th and 4th Levels were removed and restrictions to the flow of air were removed from a raise between the 7th and 6th Levels. Late in the year another ventilation survey was made and it was found that there was a material increase in the volume of ventilating air throughout the mine. A volume of 25,000 c.f.m. was measured indicating a substantial increase in the fan output compared to the previous surveys.



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7. UNDERGROUND (Cont.)

g. Ventilation (Cont.)

There were no additional permanent rock ventilation connections driven during the year. Between the 7th and 8th Levels the various raises that have been put up in the ore for mining purposes also serve very satisfactorily for ventilation. These raises will continue to serve both purposes until mining approaches the 8th Level elevation and it will then be necessary to put up a permanent ventilation raise in rock at the east end. One permanent raise for ventilation was put up from the 8th to 7th Level two years ago near the west end of the orebody but a second raise will be needed between these levels in the future.

Ventilation in the mining areas at the east end of the orebody, where mining is still being conducted above the 7th Level has been maintained by driving short drift connections on various sub levels to connect to a ventilation raise in the north footwall. In several cases it was necessary to provide booster fans to ventilate mining areas for short periods while they were isolated from regular airways. In each of the areas where mining is underway between the 7th and 8th Levels satisfactory ventilation is provided through the ladder road compartments of the raises from the 8th Level.

8. COST OF OPERATING

a. Comparative Mining Costs

	<u>1945</u>	<u>1944</u>	<u>Increase</u>	<u>Decrease</u>
Product Tons	326,633	376,863		50,230
Underground Costs	1.703	1.694	.009	
Surface Costs	.231	.258		.027
General Mine Expense	.389	.343	.046	
Cost of Production	2.323	2.295	.028	
Depreciation	.180	.210		.030
Taxes	.056	.052	.004	
Loading and Shipping	.073	.052	.021	
Total Cost at Mine	2.632	2.609	.023	
Budget Estimated at Mine	2.554	2.471	.083	
No. of Shifts & Hours	8, 1-8 Hr. 292, 2-8 Hr. -	26, 1-8 Hr. 50, 2-8 Hr. 209, 3-8 Hr.		
Total Operating Days	300	285	15	
Average Daily Product	1,089	1,223		134

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8. COST OF OPERATING (Cont.)b. Detailed Cost Comparison

	1945		1944	
	Amount	Per Ton	Amount	Per Ton
1. Exploring in Mine	10,366.88	.032	12,226.18	.032
3. Development in Rock	6,674.11	.020	10,880.59	.029
4. Development in Ore	38,364.01	.118	54,274.82	.144
5. Stopping	208,286.45	.638	228,254.14	.605
6. Timbering	155,558.26	.476	171,787.78	.456
7. Trammig	44,488.24	.136	64,447.53	.171
8. Ventilation	2,791.19	.009	1,354.08	.004
9. Pumping	12,075.95	.037	10,403.14	.028
10. Compressors & Air Pipes	21,560.93	.066	24,183.94	.064
11. Back Filling				
12. Underground Supt.	23,927.88	.073	23,625.36	.063
14. Maint. Comp. & Power Drills	887.15	.003	735.80	.002
15. Scrapers & Mech. Loaders	12,173.12	.037	13,058.88	.035
16. Electric Tram Equipment	18,073.80	.055	19,922.29	.053
17. Pumping Machinery	1,032.58	.003	3,016.37	.008
Total Undg. Costs	556,260.55	1.703	638,172.90	1.694
18. Hoisting	27,842.51	.085	29,514.99	.078
19. Stocking Ore	9,345.41	.029	18,060.26	.048
20. Screening-Crushing at Mine	219.46	.001	253.63	.001
21. Dry House	10,713.70	.033	10,721.56	.038
22. General Surface Expense	11,990.48	.037	14,319.82	.038
23. Maint. Hoisting Equipment	9,814.56	.030	13,284.77	.035
24. Shaft	2,281.43	.007	2,484.51	.007
25. Top Tram Equipment	2,090.49	.006	2,579.29	.007
26. Docks, Trestles & Pockets	623.08	.002	4,846.05	.013
27. Mine Buildings	466.95	.001	1,061.44	.003
Total Surface Costs	75,395.07	.231	97,126.32	.258
Vacation Expense	17,295.40	.053	14,122.50	.037
28. Insurance	3,214.24	.010	3,712.81	.010
29. Mining Engineering	3,187.23	.010	2,804.56	.007
30. Mech. and Elec. Engineering	1,109.69	.003	1,379.18	.042
31. Analysis & Grading	16,361.92	.050	15,730.39	.042
32. Personal Injury	24,653.71	.075	25,117.54	.066
33. Safety Department	1,502.39	.005	1,592.29	.004
34. Tel & Safety Devices	3,026.43	.009	3,103.22	.008
35. Local and Gen. Welfare	5,695.97	.017	5,552.80	.015
36. Special Expense and Allow.	5,343.51	.016	5,964.54	.016
37. Ishpeming Office	14,591.62	.045	15,375.96	.041
38. Social Security	11,506.09	.035	12,968.58	.034
39. Mine Office	18,291.41	.056	20,720.40	.055
Annuities	1,481.62	.005	1,349.85	.004
Total Gen. Mine Expense	127,261.23	.389	129,494.62	.343
Cost of Production	758,916.85	2.323	864,793.84	2.295
40. Taxes	18,344.21	.056	19,434.62	.052
Total Cost	777,261.06	2.379	884,228.26	2.347
Budget Estimated Cost		2.554		2.471



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8. COST OF OPERATING (Cont.)b. Detailed Cost Comparison (Cont.)

	1945		1944	
	Amount	Per Ton	Amount	Per Ton
41. General Supplies	13,578.34	.041	18,484.09	.049
42. Iron and Steel	4,917.39	.015	10,361.67	.027
43. Oil and Grease	1,113.14	.003	1,744.76	.005
44. Machinery Supplies	6,575.13	.020	7,492.17	.020
45. Explosives	20,233.79	.062	25,189.33	.067
46. Lumber and Timber	38,437.02	.062	49,806.56	.132
47. Fuel	2,657.86	.008	2,612.35	.007
48. Electric Power	42,487.13	.130	43,762.77	.116
49. Sundries	27,668.55	.085	37,747.16	.100
50. Other Mines and Accounts	<b>146.76</b>		<b>80.66</b>	
<b>Total Supplies</b>	<b>157,321.59</b>	<b>.482</b>	<b>197,120.20</b>	<b>.523</b>

The following are explanations of cost accounts that show significant variations compared with the previous year:

1. Exploring in Mine

The decrease in expenditures in this account is due to a smaller exploration drilling program.

3. Development in Rock

The decrease is due to a smaller rock development program.

4. Development in Ore

The decrease is due to less sub level stope development and smaller general development program.

5. Stoping

The decrease in total expense is due to a reduction in the size of underground operations. The increase in cost per ton is due to larger proportion of product mined by top slicing and increased labor cost on account of payment of shift differential.

	1945		1944	
	Amount	Per Ton	Amount	Per Ton
General Supplies	6,379.77	.021	7,796.08	.023
Iron and Steel	1,543.42	.005	3,796.16	.011
Oil and Grease	189.96	.001	373.16	.001
Machinery Supplies	454.87	.002	244.44	.001
Explosives	16,420.42	.054	18,378.50	.054
Timber and Lumber	-		1.80	.000
Electric Power	4,118.59	.013	4,352.03	.013
Sundries	4,847.92	.016	7,036.91	.021
Expense Accounts	836.17	.003	1,260.02	.004
<b>Total</b>	<b>34,791.12</b>	<b>.115</b>	<b>43,239.10</b>	<b>.128</b>



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8. COST OF OPERATING (Cont.)b. Detailed Cost Comparison (Cont.)

	1945		1944	
	Amount	Per Ton	Amount	Per Ton
Payroll Labor	163,833.15	.541	173,117.83	.511
Cliffs Shaft Labor	2.88	.000	23.30	.000
Gen. Shops Labor	1,841.92	.006	1,336.81	.004
Shops, Labor, etc.	7,817.38	.026	10,537.10	.031
<b>Total Labor</b>	<b>173,495.33</b>	<b>.573</b>	<b>185,015.04</b>	<b>.546</b>
<b>Grand Total</b>	<b>208,286.45</b>	<b>.638</b>	<b>228,254.14</b>	<b>.605</b>
Production Tons Stopped	302,758		339,020	
Avg. Miners Rate Stopping	8.46		8.54	
Avg. Tons per Man Stopping	20.86		19.19	

6. Timbering

The decrease in total expense is due to reduction in size of underground operation. Increase in cost per ton is due to higher labor cost on account of payment of shift differential.

7. Tramming

The decrease is due to tramming operations on 2-8 hour shift schedule per day for entire year as compared with 3-8 hour shift schedule during the major part of previous year.

8. Ventilation

The increase is due to constructing a number of brattices to seal off the old workings from the main airways on various upper levels. Also due to timbering an old airway and removing restrictions to flow of air in several ventilation raises.

9. Pumping

The increase in pumping cost was due to a substantial increase in the mine water. Approximately 46% of the mine water was diverted to the Morris Mine to be pumped, as compared with 45% in the previous year. As indicated in the following table the Inland Steel Company charges for pumping this water increased materially as compared with 1944 due to an increase in the proportion of Lloyd Mine water to their total volume. By means of weirs on the 7th and 8th Levels a daily record is kept of the readings to accurately determine the volume of water diverted to the Morris Mine. The following is a five year comparison of charges by the Inland Steel Company for pumping Lloyd Mine water:

Year	Total Inland Steel Co.			C.C.I. Co. Prop.		
	Amount	Percent	Avg.Gals Per Min.	Amount	Percent	Avg.Gals Per Min.
1945	43,150.99	86.88	857.6	6,518.28	13.12	96.8
1944	59,011.80	91.62	887.9	5,393.50	8.38	81.1
1943	64,159.88	89.87	932.0	6,577.81	10.13	104.9
1942	42,644.22	86.00	847.1	7,013.13	14.00	101.0
1941	60,245.97	93.22	898.4	4,225.35	6.78	66.0



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8. COST OF OPERATING (Cont.)

b. Detailed Cost Comparison (Cont.)

The following table shows a distribution of the total Lloyd Mine water pumped.

	<u>Average Gallons per Minute</u>	
	<u>1 9 4 5</u>	<u>1 9 4 4</u>
Second Level Water Supply	31.7	33.0
Fifth Level Water Supply	82.6	64.7
Seventh Level to Morris Mine	96.8	81.1
Total	<u>211.1</u>	<u>178.8</u>

Unusually heavy snow fall during the winter of 1944-45 resulted in a heavy spring run-off and accounts for a portion of the increase in mine water. A peak volume of 326 g.p.m. was reached in June, which is considerably higher than the yearly average and the peak volume reached in prior years. Heavy rain fall also accounts for a portion of the mine water increase. Gradual extension of the surface cave allows more of the surface run-off, after heavy rains and the spring break-up, to be intercepted and reach the underground workings.

10. Compressors and Air Lines

The decrease in total expense due to reduced size of underground operation and increase in cost per ton due to smaller product.

12. Underground Supt.

The increase is due to payment of bonus of \$125.00 to each foreman on monthly salary.

15. Maintenance of Scrapers and Mech. Loaders

The decrease in total expense is due to reduction in size of underground operation and increase in cost per ton due to purchase of one new scraper hoist unit.

16. Electric Tram Equipment

The decrease in total expense is due to less repairs on account of reduced tramming schedule and increase in cost per ton due to smaller product.

17. Pumping Machinery

The decrease in expense is due to less repairs and no purchases of new equipment.

18. Hoisting

The decrease in total expense is due to reduction in hoisting schedule to 2-8 hour shifts per day and increase in cost per ton is due to payment of shift differential.

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8. COST OF OPERATING (Cont.)

b. Detailed cost comparison (Cont.)

19. Stocking Ore

The decrease in this expense is due to considerably less trestle construction.

22. General Surface Expense

The decrease is due to smaller labor force employed on surface on account of reduced size of underground operation.

23. Maintenance of Hoisting Equipment

The decrease in this expense is due to less repairs required as compared to the previous year when a serious breakdown occurred when head sheave axel broke, causing north skip rope to break.

25. Top Tram Equipment

The decrease is due to less repairs to cars and less rope replacements on account of reduced operating schedule.

26. Docks, Trestles and Pockets

The large decrease in this expense is due to the small amount of repairs required on account of the rebuilding and repairs made in the previous year.

27. Mine Buildings

The decrease is due to only minor repairs made to surface buildings and there was no new construction.

28. Vacation Expense

The large increase is due to payment of retroactive vacation adjustment.

29 - 41 Inclusive

The total expense for most of these accounts decreased slightly, but the cost per ton, with only two exceptions, increased due to a smaller production.

42. Taxes

The decrease in the total amount of taxes is due to a reduced valuation but increase in cost per ton is due to slightly higher tax rate and smaller production.



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9. EXPLORATION AND FUTURE EXPLORATIONS

A drilling program was continued to outline the extent of the main orebody below the 8th Level and also to further explore the area southwest of the main deposit. A total of five additional holes were drilled with the Gopher Drill, two of which were inclined holes that crosscut the main orebody below the 8th Level, and three holes were drilled horizontally to the south from the 8th Level to outline the orebody south of the dike before development was undertaken. The extent of the main orebody below the 8th Level has been well defined by drilling and the orebody south of the dike has been outlined by drilling and subsequent development. On the basis of this information, development of the 9th Level was undertaken.

Drilling with the deep hole machine was continued from the previous year and in addition to completing one hole into the area southwest of the main orebody, a second hole was drilled into this area from a station farther west. Both of the holes were drilled horizontally from the 8th Level to explore the favorable structure that has been developed between the main orebody and the Morris Mine boundary. A short run of ore was encountered in the hole that was drilled from the most easterly location but no concentration was encountered in the second hole. This area has been extensively drilled from both the 7th and 8th Levels and in spite of the favorable structure and formation none of the holes have encountered ore of any importance.

Exploration drilling in the latter area was abandoned shortly after the middle of the year and later the drilling program with the Gopher machine was also completed. At the close of the year there was no exploration drilling being conducted and none was planned for the near future. However, at a later date at least one long hole will be drilled from the end of the south crosscut on the 8th Level to explore the structure to the south.

The following is a comparison of the costs and the footages drilled during the year:

	<u>Feet</u>	<u>Cost per Foot</u>	<u>Total</u>
Deep Hole Drill	1132	\$ 2.87	\$ 3,256.55
Gopher Drill	1073	6.62	7,110.33
	<u>2205</u>	<u>4.70</u>	<u>\$ 10,366.88</u>

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9. EXPLORATIONS AND FUTURE EXPLORATIONS (Cont.)

The following is a log of the drilling with the Deep Hole Drill.

<u>D.D.H. No. 169</u>		<u>D.D.H. No. 174</u>	
<u>8th Level S56°W - Dip 0°</u>		<u>8th Level S29°W - Dip 0°</u>	
<u>Depth</u>	<u>Material</u>	<u>Depth</u>	<u>Material</u>
0' - 204'	Slate	0' - 746'	Slate
204' - 249'	Dike	746' - 774'	Tr. Sl. & Jas.
249' - 279'	Slate	774' - 780'	Dike
279' - 292'	Ore	780' - 798'	Tr. Sl. & Jas.
292' - 471'	Slate	798' - 876'	S.O.J.
471' - 499'	Tr. Sl. & Jas.	876' - 904'	Dike
499' - 529'	S.O.J.	904' - 1054'	S.O.J.
529' - 561'	S.O.J.		
561' - 564'	Dike		
564' - 607'	S.O.J.		

The following is a log of the drilling with the Gopher Drill.

<u>D.D.H. No. 170</u>		<u>D.D.H. No. 171</u>	
<u>8th Level South - Dip 0°</u>		<u>8th Level S9°W - Dip 0°</u>	
<u>Depth</u>	<u>Material</u>	<u>Depth</u>	<u>Material</u>
0' - 45'	S.O.J.	0' - 15'	Ore
45' - 55'	Lean Ore	15' - 55'	Dike
55' - 115'	S.O.J.	55' - 185'	S.O.J.
115' - 140'	Lean Ore	185' - 190'	Lean Ore
140' - 160'	Ore	190' - 210'	Ore
160' - 163'	Dike	210' - 228'	Ore
163' - 168'	Ore	228' - 245'	Slate
168' - 196'	Slate		

  

<u>D.D.H. No. 172</u>		<u>D.D.H. No. 173</u>	
<u>8th Level S30°E - Dip 0°</u>		<u>8th Level South - Dip 0°</u>	
<u>Depth</u>	<u>Material</u>	<u>Depth</u>	<u>Material</u>
0' - 10'	Ore	0' - 50'	Slate
10' - 13'	Dike	50' - 135'	Ore
13' - 15'	Ore	135' - 140'	S.O.J.
15' - 22'	Lean Ore	140' - 155'	Slate
22' - 76'	Dike	155' - 185'	Dike
76' - 90'	Ore	185' - 245'	Slate & Graywacke
90' - 130'	Ore		
130' - 140'	Ore		
140' - 150'	S.O.J.		
150' - 180'	Slate		

<u>D.D.H. No. 175</u>	
<u>8th Level S3°-29'E - Dip 67°</u>	
<u>Depth</u>	<u>Material</u>
0' - 62'	Slate
62' - 127'	Ore
127' - 140'	Lean Ore & Jasper
140' - 193'	Ore
193' - 252'	Dike



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10. TAXES

The following shows a comparison of the taxes paid in 1945 and 1944 in Ishpeming Township:

	1945		1944	
	Valuation	Taxes	Valuation	Taxes
<u>Lloyd &amp; Section 6</u>				
SW $\frac{1}{4}$ of NW $\frac{1}{4}$ of Sec. 6, 47-27)				
40 Acres, N $\frac{1}{2}$ of SW $\frac{1}{4}$ of Sec 6)				
47-27, 81.67 Acres, N $\frac{1}{2}$ of SW $\frac{1}{4}$ )				
of Sec. 6, 47-27, 80 Acres)	685,000	12,537.97	560,000	10,191.72
Personal, Ore in Stock, Supplies and Equipment	305,000	5,582.60	495,000	9,008.75
Total by State Tax Comm.	990,000	18,120.57	1,055,000	19,200.47
Collection Fees		181.21		192.01
Total Taxes		18,301.78		19,392.48
<u>CCICo. Misc. Lands</u>				
S $\frac{1}{2}$ of NE $\frac{1}{4}$ of Sec. 6, 47-27	320	5.86	320	5.82
SE $\frac{1}{4}$ of NW $\frac{1}{4}$ of Sec. 6, 47-27	350	6.41	350	6.37
S $\frac{1}{2}$ of SW $\frac{1}{4}$ of Sec. 6, 47-27	700	12.81	700	12.74
SW $\frac{1}{4}$ of SE $\frac{1}{4}$ of Sec. 6, 47-27	350	6.41	350	6.37
SE $\frac{1}{4}$ of SE $\frac{1}{4}$ of Sec. 6, 47-27	575	10.52	575	10.46
Total	2,295	42.01	2,295	41.76
Collection fees		.42		.42
Total CCICo. Misc. Lands		42.43		42.18
Total Lloyd	992,295	18,344.21	1,057,295	19,434.66
Taxes Lot 4 Blk.2, W. Ishp.	50	.93	50	.91
<u>North Lake Dwellings</u>				
Houses on Sec. 6, 47-27	4,500	82.37	4,500	81.90
Collection fees		.82		.82
Total Dwellings		83.19		82.72
Total Ishp. Township	996,845	18,428.33	1,061,845	19,518.29
Rate		1.830		1.81995

The decrease in taxes is due to a substantial decrease in valuation on personal property. There was a slight increase in the tax rate but this was more than off-set by the reduced valuation.

	1945	1944	1943	1942	1941
Taxes per ton produced	.056	.052	.049	.069	.082
Taxes per ton shipped	.054	.070	.043	.067	.099

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11. ACCIDENTS AND  
PERSONAL INJURY

The accident frequency and severity rate shows considerable improvement as compared with the previous year but the record is not an enviable one from the standpoint of number of accidents. The severity fortunately was not in proportion to the number of accidents. Due to a smaller average number of men employed throughout the year, the total man days worked dropped from 74,932 in 1944 to 62,270 in 1945. The total man days lost on account of all accidents was 620 and for compensable accidents only a total of 575 man days was lost.

The following table shows a comparison of the accident frequency and severity rate for the past two years:

<u>Year</u>	<u>Frequency Rate</u>	<u>Severity Rate</u>
1945	20.07	1.154
1944	28.36	11.97

Frequency Rate - Number of accidents per 1,000,000 man hours

Severity Rate - Number of days lost per 1,000 man hours.

The compensable accidents are listed in detail as follows:

Accident No. 852, February 31, 1945, Lawrence Barry - Contract Miner. A piece of timber and some ore fell from the back and struck him on the right shoulder as he was trimming loose ground to make room for timber. - Fracture of right scapula and contusion of right side. - Time lost - 54 days.

Accident No. 853, February 22, 1945, Peter Mongiat - Brakeman. A piece of ore fell through the chute and struck him on the left hand as he was blowing the chute while filling a motor car. Fracture of first metacarpal bone of left hand. - Time lost - 27 days.

Accident No. 854, April 4, 1945, John Koski, Contract Miner. A piece of ore fell from the side of a slice and struck him on the right side and ankle as he was shoveling a hitch for a prop. Fracture of right Fibula. Time lost - 55 days.

Accident No. 855, May 1, 1945, Dominic Tasson, Jr., Contract Miner. While placing the bottom sprag to a set of timber a large chunk fell from the side of the slice onto the stage collapsing it and pinning him under the stage. Fractured two ribs and contusion of left side and foot. - Time lost - 63 days.

Accident No. 856, June 8, 1945, Pasquale Meni, Company Account Miner. While lashing timber in preparation to hoisting it to a sub level he slipped on a pole and twisted his left knee. Sprain of left knee. - Time lost - 78 days.



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11. ACCIDENTS AND  
PERSONAL INJURY (Cont.)

Accident No. 857, July 6, 1945, Robert Peterson, Contract Miner. A large chunk of ore that dropped from the back rolled down the pile and struck him and knocked him down against a piece of cribbing timber that was in the pile of broken ore. Sprain of left knee and ankle and incomplete fracture of left femur. Time lost - 104 days.

Accident No. 858, June 30, 1945, George Ollila, Chuteman. While loading a car at a chute a chunk of ore came through the chute and struck him on the right hand. Fracture of right hand index finger. - Time lost - 42 days.

Accident No. 859, July 18, 1945, George Carlson, Contract Miner. While he was standing on the top cribbing timber in a raise barring a loose piece of ore from the back a piece of the chunk fell and struck the timber on which he was standing and glanced onto his left ankle. Fracture of left ankle. - Time lost 123 days.

Accident No. 860, August 24, 1945, Reino Lepisto, Company Account Miner. While barring chunks through a chute one of the chunks struck the end of the bar he was using, causing it to slip out of his grasp and strike him on the left side. Fracture of 7th and 12th ribs left side. - Time lost - 19 days.

Accident No. 861, July 28, 1945, Victor Karkkainen, Company Account Miner. While dumping cars at the pocket the car sprung back and as he tried to hold it he strained his back. Strained back. - Time lost - 11 days.

12. NEW CONSTRUCTION AND  
PROPOSED NEW CONSTRUCTION

There was very little new construction during the year. The erection of stocking trestle before the close of the shipping season comprised the most important construction. A total of 28 bents of wood trestle were erected to the east of the shaft and five bents were erected as an extension to the trestle to the west of the shaft. As mentioned under the heading "Buildings" some changes were made in the interior of the check-room building to provide a first aid room and some minor changes were also made in the underground dry house. Only occasional minor repairs were required to maintain the surface buildings in good condition. There is no important new construction planned or anticipated for the coming year.

13. EQUIPMENT AND PROPOSED EQUIPMENT

New equipment added to the inventory consisted only of the purchase of one new scraper hoist. There is a surplus of some items of equipment due to a gradual reduction in the size of the underground operation and this applies particularly to drill machines and scraper hoists. In the case of scraper hoists however, many of the units are of the older type and do not compare with the latest models in power or speed. For this reason, it became advisable to purchase, for a transfer operation, a new unit with a higher power and speed rating.

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13. EQUIPMENT AND PROPOSED EQUIPMENT (Cont.)

Development of the 9th Level will require the purchase of some additional equipment during the coming year. The most important single item of equipment for this development will be the hoist and its accessories that will be installed on the 8th Level. A high pressure fan is on order and will be used to ventilate the heading until a raise connection has been completed from the 9th Level development to the 8th Level. A small size pump will also be needed upon completion of the winze to the desired depth. To enable handling the tram cars on the cage, a larger cage than standard size will be purchased from the Maas Mine for use in the winze.

The following is the new equipment added to the inventory in 1945:

<u>Number of Items</u>	<u>Items</u>	<u>Cost</u>
1	15 NM2C, IR Scraper Hoist	\$ 1,470.78

14. MAINTENANCE AND REPAIRS

a. Mine

There was a general decrease in the maintenance expense of all equipment. This was due to a decrease in the size of the mine operation and also because of the large amount of maintenance work done in the previous year. An important item of maintenance last year was the rebuilding of the skip dumps and chute in the headframe and consequently there was very little maintenance expense on this account in 1945. The reduced hoisting and tramming schedule has resulted in a more efficient operation and is reflected in less maintenance of this equipment. Maintenance work in the shaft and the expense has decreased in proportion to the decrease in the size of the operation and smaller production. Regular mid-week and weekend inspections of the shaft compartments has been continued and it is a very important part of the shaft maintenance. In each of the skip roads some worn out runners have been replaced but most of the work has consisted of replacing hardwood wear strips on the sides of the runners. In the upper part of the shaft above ledge, some new casing plank was installed replacing rotted casing. This work was not completed by the end of the year and there remains a substantial amount of casing that must be replaced in the upper part of the shaft in 1946.

Repairs to timbered drifts underground have been continued at about a normal rate. During the early part of the year this work was confined mostly to drifts on the 7th Level in the south footwall drift. As mining was conducted on the last subs from the 7th Level raises, this drift was subjected to heavy crushing and required extensive repairs until mining from 8th Level raises was started and then portions of the 7th Level drift were abandoned. During the coming year repair work will be concentrated in the main level ore drift on the 8th Level where timber that was installed about three years ago is showing signs of rotting.



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14. MAINTENANCE AND REPAIRS (Cont.)

a. Mine (Cont.)

Due to the operating schedule of six days per week, repairs in mining raises, have of necessity, been made during the regular operating shifts. In many cases contracts were off production on this account for a number of days before repairs were completed. In many of the long raises from the 8th to 7th Level, maintaining the hardwood plank lining in the chute compartment has been the biggest item in raise repairs.

b. Location

1. General Maintenance

Location maintenance was considerably less than in the previous year. The largest item of expense as in prior years is the pumping cost for the water supply and this has decreased due to a smaller proportion of the supply being furnished from the Second Level and a larger proportion from the Morris Mine No. 8 surface well. Two bad leaks developed in the wood water main in the location and it was necessary, in the case of one of the leaks, to dig a substantial amount of ditch to locate the break and make the repairs.

	<u>Labor</u>	<u>Supplies</u>	<u>Total</u>
Water		3,024.88	3,024.88
Water Mains	39.78	2.17	41.95
Cleaning	64.05		64.05
Water Piping	249.31	76.39	325.70
Xmas Tree	8.03		8.03
Total	\$ 361.17	\$ 3,103.44	\$ 3,464.61

The following table shows a comparison of total location maintenance expense for the past five years:

<u>Year</u>	<u>Amount</u>
1945	\$ 3,464.61
1944	4,358.71
1943	4,433.54
1942	4,439.13
1941	6,261.66

2. Rented Buildings

The large decrease in maintenance expense on rented buildings was due to the fact that very little repair work was required. The repairs consisted mostly of patching the roof on the store building and applying a coat of asphalt to cover the entire roof. Some minor repairs were also made to the roof of the Mather Mine superintendent's house.

In December, one of the two remaining houses owned by the Company was sold. The house that was sold was a cottage type house and it was disposed of on a cash basis to the tenant who is an employee at the mine. There has been no sale for the other dwelling.

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14. MAINTENANCE AND REPAIRS (Cont.)

2. Rented Buildings

The following is a comparison of the expenditures on rented buildings for the past five years:

<u>Year</u>	<u>Amount</u>
1945	403.95
1944	\$ 3,290.52
1943	737.91
1942	360.90
1941	1,145.53

Only minor routine repairs were made to the club house to maintain it in good condition. The operating deficit increased slightly as compared with the previous year and this was due to less membership fees collected and smaller receipts from the club house facilities.

<u>Year</u>	<u>Proportion of Operating Deficit</u>		<u>Total</u>
	<u>Lloyd Mine</u>	<u>Inland Steel Co.</u>	
1945	\$ 2,785.33	\$ 960.00	\$ 3,745.33
1944	2,569.79	960.00	3,529.79

15. POWER

There were no delays to operations due to a lack of electric power. The decrease in total K.W.H. and total cost is due to a reduction in the size of the operation. The following is a five year comparison of power consumption and costs:

<u>Year</u>	<u>K.W.H.</u>	<u>Cost</u>	<u>Rate</u>
1945	2,937,800	\$ 43,337.04	.0148
1944	3,090,000	44,655.12	.0145
1943	3,633,600	50,699.76	.0139
1942	3,751,200	52,200.96	.0139
1941	3,631,200	50,289.84	.0138

16. WATER SUPPLY

The amount of water pumped from the 2nd Level for location water supply is gradually decreasing and the surface well at the Morris Mine is the main source for this supply. Almost every day except Sundays and holidays water is pumped from the Morris surface well to the location reservoir tank. The chlorinators have given dependable service at both sources from which the water supply is obtained.

17. CONDITION OF PREMISES

The premises have been maintained in good condition and in the summer months the lawn and flower garden particularly have been kept in very attractive condition. In the summer the lawn has shown a healthy growth and has been mowed regularly and watered when needed. The shrubbery and trees have been pruned and also show healthy growth.



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18. NATIONALITY OF  
EMPLOYEES

	<u>American Born</u>	<u>Foreign Born</u>	<u>Total</u>	<u>Per Cent</u>
Finnish	65	25	90	40
Italian	21	24	45	20
French	34	1	35	15
Swedish	19	4	23	10
English	16	4	20	9
Norwegian	7	-	7	3
Austrian	3	-	3	1
Irish	2	-	2)	
German	1	-	1)	2
Belgian	1	-	1)	
Total	169	58	227	100

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1. GENERAL:

Operations during the year, which was the fifth since the starting of shaft sinking, were entirely dependent on the supply of labor. Man power was rationed among the numerous projects in proportion to the relative importance of each. Without the forty men from the Holmes Mine which were hired early in the year, the picture would have been far worse. The production of 203,091 tons in 1945 was approximately the amount estimated some time ago for the fourth year of operation. Main level development was also approximately one year behind schedule. The net gain in the labor force of about 50% over that in 1944 played an important part in attaining this production.

Most satisfactory local labor relations, a high morale and a sharp increase in employment trends by the end of the year made the outlook for 1946 very bright, except for a strike scheduled for January 14th by the national leaders of the CIO. At this writing, the strike, which includes every producer of iron ore in the Lake Superior District, was in effect in spite of having been postponed until February 8th.

The labor shortage forced a reduction in operations from three to two shifts per day; but the schedule was increased from five to six days per week in January. The addition of forty men in February and March, and continued employment throughout the rest of the year, made it possible to work most of the developed areas at near capacity and still concentrate on several large important projects:

Drifting and drilling on the 960' Level were completed prior to the installation of the pumps which were started late in September. By the end of October, the old Cleveland Hematite workings had been drained and by the end of the year the rest of the underground water had decreased to 205 G.P.M. from a high of 380.

The development of the 5th Level was continued throughout the year with three cross-cuts completed and two working places in production by the end of the year.

The 6th Level plat was completed and drifting toward the ore body started by December.

The construction and installation of surface buildings and equipment was almost complete with the exception of the timber yards and the extensions of the stocking trestles and grounds.



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2. PRODUCTION,  
SHIPMENTS &  
INVENTORIES:

a. Production by Grades:

	<u>1945</u>			<u>1944</u>	
	<u>Product</u>	<u>Transfers</u>	<u>Stockpile Overrun</u>	<u>Total</u>	<u>Total</u>
Mather	95,485	16,439	617	112,541	39,653
Mather Special	<u>105,824</u>	<u>16,439</u>	1,165	90,550	<u>15,068</u>
Total	201,309	0	1,782	203,091	54,721
Rock				57,057	72,717

b. Shipments:

<u>Grade of Ore</u>	<u>Pocket Tons</u>	<u>Stockpile Tons</u>	<u>Total Tons</u>	<u>Total Tons Last Year</u>
Mather	79,752	25,082	104,834	33,404
Mather Special	<u>41,821</u>	<u>21,550</u>	<u>63,371</u>	<u>7,436</u>
Total	121,573	46,632	168,205	40,840

The stockpiles of both grades were completely cleaned up during the shipping season. Stockpile inventories represent the amount produced between the end of the shipping season and the end of the year.

c. Stockpile Inventories:

	<u>1945</u>		<u>1944</u>
Mather	13,956	Tons	6,249
Mather Special	<u>34,811</u>	"	<u>7,632</u>
Total	48,767	"	13,881

d. Division of Product by Levels:

	<u>Mather</u>	<u>Mather Special</u>	<u>Total Tons</u>
Second (1600') Level	97,577	89,995	187,572
Fifth (2050') Level	<u>14,964</u>	<u>555</u>	<u>15,519</u>
Total	112,541	90,550	203,091*

\* Including current year stockpile overrun and transfers.

The percentage of Mather grade produced above the 2nd Level was limited by the very wet conditions above #1 Cross-cut. Practically all of the mining operations in the east end were in the Special area.



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2. PRODUCTION,  
SHIPMENTS &  
INVENTORIES:  
(Continued)

e. Production by Months:

<u>Months</u>	<u>Mather</u>	<u>Mather Special</u>	<u>Total</u>	<u>Rock</u>
January	4,042	2,673	6,715	5,203
February	2,827	4,268	7,095	6,402
March	6,677	5,588	12,265	7,546
April	11,299	3,419	14,718	4,015
May	12,898	3,013	15,911	4,356
June	9,191	8,514	17,705	5,236
July	5,964	9,643	15,607	4,356
August	7,907	8,259	16,166	3,641
September	11,314	6,452	17,766	5,005
October	6,060	15,404	21,464	5,302
November	4,802	22,077	26,879	3,179
December	<u>12,504</u>	<u>16,514</u>	<u>29,018</u>	<u>2,816</u>
Total	95,485	105,824	201,309	57,057
Transfers	16,439	16,439	0	
Current Year				
Stockpile Overrun	<u>617</u>	<u>1,165</u>	<u>1,782</u>	
	112,541	90,550	203,091	

f. Ore Statement:

	<u>Mather</u>	<u>Mather Special</u>	<u>Total</u>	<u>Total Last Year</u>
On hand January 1, 1945	6,249	7,632	13,881	-
Output for Year	95,485	105,824	201,309	54,721
Transfers	16,439	16,439	-	-
Overrun	617	1,165	1,782	-
Total	118,790	98,182	216,972	54,721
Shipments	104,834	63,371	168,205	40,840
Balance on Hand	13,956	34,811	48,767	13,881
Increase in Output	55,832	90,756	146,588	52,924
Increase in Ore on Hand			34,886	13,881

Working Schedule:

- 1945 - 3-8 Hr. shifts, 5 days per week, Jan. 1st to 3rd, 1945.  
 2-8 Hr. shifts, 5 days per week, Jan. 4th to 19th, 1945.  
 2-8 Hr. shifts, 6 days per week, Jan. 22nd to Dec. 31st, 1945.
- 1944 - 3-8 Hr. shifts, 5-1/3 days per week, Jan. 1st to July 31st, 1944.  
 3-8 Hr. shifts, 5 days per week, Aug. 1st to Dec. 31st, 1944.
- 1943 - 3-8 Hr. shifts, 5-2/3 days per week, Jan. 1st to 31st, 1943.  
 3-8 Hr. shifts, 5-1/3 days per week, Feb. 1st to Dec. 31st, 1943.
- 1942 - 3-8 Hr. shifts, 5-2/3 days per week, Jan. 1st to Dec. 31st, 1942.
- 1941 - 1-8 Hr. shift, 6 days per week, Jan. 1st to Jan. 12th, 1941.  
 2-8 Hr. shifts, 5 days per week, Jan. 13th to 28th, 1941.  
 3-8 Hr. shifts, 5-2/3 days per week, Jan. 29th to Dec. 31st, 1941.



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3. ANALYSIS:

a. Average Mine Analysis on Output:

<u>Grade</u>	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Sulphur</u>
Mather	61.17	.116	5.76	.053
Mather Special	60.96	.108	6.64	.132

b. Average Analysis on Straight Cargoes:

All of the shipments during 1945 were in mixed cargoes.

c. High Sulphur Ore:

The raising of the sulphur guarantee in the Standard grade from .035 to .050 had the effect of greatly increasing the amount of Standard ore above the 2nd Level, since in a good many areas the average sulphur content is low enough to permit mixing with better grade ore. In general, all of the ore developed on the 2nd Level east of #4 Cross-cut was too high in sulphur to be directly graded as Standard. However, considerable reserves above the level were developed with a decreased sulphur content low enough to come within the guarantee of .050. There is every indication that the sulphur content becomes higher between the 2nd and 3rd Levels. South of the main dike both above and below the level, the sulphur content is extremely high. It is probable that only small amounts of this ore will be mined under present conditions since it would take a very large proportion of low sulphur to grade this material into a mixture which would be acceptable even as Special grade.

Additional development above #1 Cross-cut showed an appreciable tonnage of high sulphur ore south of the Standard ore which was developed the previous year. Above the level this material is not extensive but below the level in this area practically all of the ore is too high in sulphur for the Standard grade.

Above #2 and #3 Cross-cuts where practically no ore was encountered on the level, a considerable tonnage has been developed to a height of 200'. At approximately the half way point, on the -60' sub-level, the reserves are approximately one-half Standard and one-half Special. A short distance above this elevation the high sulphur apparently disappears and the reserves are high grade Standard ore.

Since work on the 3rd Level was discontinued in April of 1944, no additional information was obtained. On the 5th Level, however, the results were very encouraging since no high sulphur has been encountered to date either on the level, or on any of the sub-levels above.

d. Complete Analysis of Ores in Stock:

	<u>Iron</u>	<u>Phos.</u>	<u>Silica</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sulph.</u>	<u>Loss</u>	<u>Moist.</u>
Mather	60.68	.116	6.28	.16	2.91	.56	.57	.052	2.01	11.45
Mather Special	61.05	.115	6.56	.12	2.79	.70	.50	.127	1.93	11.13



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4. ESTIMATE AND  
ANALYSIS OF  
ORE RESERVES:

Once again the estimate of ore reserves was made by supplementing the surface drill hole sections, with additional sections built up by information obtained in underground exploration and development. There was one general change in the method of estimating, the use of a 10% deduction for rock and loss in mining as compared with 10 plus 10 in previous years. Therefore, comparison with last year is made prior to the second deduction. Once again there is a large tonnage of ore not included in the estimate, where the sulphur content is too high for mixing into the Special grade.

Assumption: 12 cu.ft. equals one ton.  
10% deduction for rock and loss in mining.

	<u>Mather Standard</u>	<u>Mather Special</u>	<u>Total Tons</u>
Reserves Indicated by Surface Diamond Drilling (Same as 1944).....	7,990,818	0	7,990,818
Reserves Indicated by Underground Development....	<u>2,054,527</u>	<u>1,252,686</u>	<u>3,307,213</u>
Total Gross Dec. 31, 1945.	10,045,345	1,252,686	11,298,031
Less 10% for Rock and Loss in Mining.....	<u>1,004,534</u>	<u>125,269</u>	<u>1,129,803</u>
Total Net Dec. 31, 1945....	9,040,811	1,127,417	10,168,228

In as much as the above estimate was made by means of additional sections to supplement the originals, there has been no attempt to estimate these reserves by levels. This will probably be done next year when more specific information is available.

A comparison with last year's estimate indicates a gain of practically 1,500,000 tons of Standard ore and 500,000 tons of Special, or approximately 2,000,000 tons including the production for the year.

	<u>Mather Standard</u>	<u>Mather Special</u>	<u>Total Tons</u>
Net Total Dec. 31, 1945	9,040,811	1,127,417	10,168,228
Net Total Dec. 31, 1944	<u>7,667,252</u>	<u>706,516</u>	<u>8,373,768</u>
Net Gain in Reserves	1,373,559	420,901	1,794,460
1945 Production	<u>112,541</u>	<u>90,550</u>	<u>203,091</u>
Gross Gain in Reserves	1,486,100	511,451	1,997,551



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4. ESTIMATE AND  
ANALYSIS OF  
ORE RESERVES:  
(Continued)

<u>Grade</u>	<u>Expected Average Natural Analysis of Ore Reserves:</u>										
	<u>Total Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Lime</u>	<u>Mag.</u>	<u>Sulph.</u>	<u>Loss</u>	<u>Moist.</u>
Mather by Surface											
Diamond Drilling...	7,191,736	53.15	.122	5.08	.25	2.62	.58	.60	.014	1.97	12.50
Mather by											
Undg. Development..	1,849,075	53.00	.160	6.50	.20	2.40	.80	.50	.030	2.45	11.50
Mather Special by											
Undg. Development..	<u>1,127,417</u>	52.00	.125	6.50	.20	2.50	1.60	.50	.250	2.00	11.50
	<u>10,168,228</u>										

5. LABOR AND WAGES:

a. Comments

The number of men on the payroll at the beginning of the year was 148 and the average number of men working during December of 1944 was 141. During the next few months, there was a very rapid gain in employment due to the hiring of approximately 40 men who were laid off when the Oliver Iron Mining Company suspended operations at its Holmes Mine. Employment remained practically stationary, with an average of 186 men working, throughout the balance of the year until November when servicemen started to return from the armed forces. By the end of the year the number of men on the payroll had reached a total of 224, with an average number working during December of 209.

The total of 224 at the end of the year shows a net gain of 76 men, most of whom were hired for underground work since the surface crew increased only from 57 to 63. During the year there were 110 men hired, of whom 72 were new employees, 33 were transfers from other mines, and 5 were returning Mather Mine veterans. A large number of the new men and transfers were also returning servicemen. The number of separations totaled 34.

In general the new employees added to the force were of better than average caliber, particularly the returning servicemen and the men obtained from the Oliver Company. These latter men were all experienced, physically fit underground workers who fitted into the organization perfectly. Without them the year's production could never have been attained. There continued to be an ample supply of surface labor due to the failure of a good many men to meet the physical requirements for underground work. Several of the additions to the surface force were due to construction work of a temporary nature. At this property there are still jobs available for a large number of underground men of all classifications.

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5. LABOR AND WAGES:  
(Continued)

a. Comments (Continued)

The contract with the CIO continued in force throughout the greater portion of the year with a new contract going into effect on September 14th. Pursuant to the directive order dated March 23, 1945 of the National War Labor Board, the contract contained a provision for a shift differential of \$.05 per hour retroactive to January 4, 1944. The carrying of this shift differential on the mine payroll was actually started on December 15, 1945 and payment was made to the retroactive date. The contract also included a major change in the vacation with pay plan in that one week's vacation is now allowed after continuous employment of one year, and two weeks for continuous employment of 5 years. This provision was also retroactive to 1944. The percentage of employees belonging to the Union increased from 65% at the beginning of the year to 80% by the end of the year due to constant activity on the part of the organizers. None of the employees choose to take advantage of the 15 day "escape period" which was offered early in the year. In general, employee relations were excellent and the two formal grievances which were presented were disallowed.

There were two changes in the working schedule: one on the 3rd of January when the 3rd shift was abolished due to lack of men, and the other on the 19th of January when the schedule was increased from 5 to 6 days per week. The 6 day per week operating schedule continued throughout the balance of the year. As a result of this increased working schedule, absenteeism increased from an average of 2½% during the early months to approximately 5% throughout the latter months of the year. Neither of these figures, however, is large enough to cause any particular concern. All of the eligible employees were urged to take a week vacation sometime during the year, but a surprisingly small group took advantage of the opportunity. Such vacations as were taken, were either staggered to permit a continuous operation, or were handled by eliminating the afternoon shift during the week of August 13th to 20th. As it happened, there was no work during two days of this week due to V-J Day celebrations. Payment of rate and one-half for work done in excess of eight hours per day or forty hours per week was continued as were the provisions for holidays and double time.

With the exception of the \$.05 per hour shift differential, the wage structure remained unchanged throughout the year at \$.78 per hour for common surface labor and \$.86½ per hour,



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5. LABOR AND WAGES:  
(Continued)

a. Comments (Continued)

or \$6.92 per day, for company account miners. The set contract price for main level drifting and cross-cutting with 5-man crews remained at \$11.00 per foot for untimbered rock drift and \$13.00 per foot for timbered rock drift. The price for main level timbered ore drift varied from \$11.00 to \$13.00 per foot depending on conditions. The high contract pay for the year, exclusive of overtime and shift differential, was \$14.12 per day as compared with \$15.04 in 1944. This rate was paid for one pay period to the single shift raising crew which was working in the ventilation connection between two of the main levels. The average wages per day for both surface and underground show a considerable increase due to the retroactive payment for both shift differential and increased vacations allowances. The amount of overtime worked also tended to increase the average. The average monthly earnings were also greatly increased due to the above factors and also to the fact that the average working month was 25 days as compared with 21-1/3 days during 1944. The average increase in monthly earnings, both surface and underground, was approximately \$46.00 per month.

b. Comparative Statement of Wages:

	<u>1945</u>		<u>1944</u>	
<u>Number of Shifts &amp; Hours:</u>	7	1-8 hr.	29	1-8 Hr.
	292	2-8 hr.	2	2-8 hr.
	2	3-8 hr.	245	3-8 hr.
Equiv. to	298½	2-8 hr.	256	3-8 hr.
 <u>Average No. of Men Working:</u>				
Surface		61-3/4		61
Underground		120-1/4		91-1/4
Total		182		152-1/4
 <u>Average Wages per Day:</u>				
Surface		\$7.66		\$7.12
Underground		9.75		9.33
Total		\$8.90		\$8.28
 <u>Wages per Mo. of 25 Days:</u>				
Surface		\$191.50		\$151.89 (21-1/3 days)
Underground		243.75		199.04 "
Total		\$222.50		\$176.64 "
 <u>Total No. of Days:</u>				
Surface		24,356-3/4		22,472-3/4
Underground		35.754		24,776-1/2
Total		60,110-3/4		47,249-1/4
 <u>Amount for Labor:</u>				
Surface		\$186,765.90		\$160,160.36
Underground		348,688.38		231,235.35
Total		\$535,454.28		\$391,395.71

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6. SURFACE:

a. Buildings:

The construction of the new storage building east of the shop wing was completed early in the year and put into use almost immediately. This much needed storage space has considerably eased the crowded conditions in the shops and main warehouse.

Routine additions to the clothes racks and benches in the change rooms were made from time to time as needed. A decision was finally reached to eliminate the use of lockers in the clean clothes dry in favor of metal baskets hung on chains. This arrangement, in addition to increasing the capacity of the room, is proving more satisfactory than lockers.

In order to improve the insurance rate, approved class A fire doors were ordered for four of the openings between the engine house wall and the dry and shop wings. Two other openings, which were of no particular value, were closed up as an alternative to installing additional fire doors. The fire doors will be installed in 1946 as soon as they are received. An additional reduction in rate was obtained by the extension of the 6" water main to a new hydrant north and west of the shop wing.

b. Headframe:

Changes in the headframe were made from time to time as indicated by experience with the handling of the ore from the skip dumps to the railroad pockets. Several changes in design improved the handling considerably and more are indicated for the future. The new design of the railroad pocket on the north side worked quite satisfactorily but indicated the desirability for further changes to the south pocket which will be rebuilt early in 1946. There is also considerable difficulty with ice which forms from condensing moisture in the air discharged from the mine. Several plans for relieving this condition are under consideration.

c. Stockpiles and Stocking Trestles:

Due to the unforeseen necessity for handling two grades of ore, the Special grade was stocked around the end bent of the south extension of the trestle which was left unfinished pending further investigation as to the desired distance between the piles. The Mather ore was stocked from the cantilever extending beyond a specially designed bent. Fortunately the Special ore was quite dry and it was possible to remove it without any serious damage to the trestle. The Standard ore, however, was extremely wet when stocked and did a great amount of damage to the steel members comprising the bent west of the cantilever dumping point. Accordingly, after the ore had been removed, a new tubular column similar in design to those in use at the Negaunee Mine, was erected at a point 50' beyond the last bent on the north trestle; and the trestle was extended by means of a cantilever 25' beyond this column. This permitted removal of the damaged bent without injury to the main structure. The



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6. SURFACE:  
(Continued)

c. Stockpiles and Stocking Trestles (Continued):

legs in the last bent to the south were straightened and the trestle extended around the curve to the east at a distance of 220' from the north trestle. The last bent of this extension was also of the new tubular construction. The above work, which was done by the Worden-Allen Company, was completed late in the fall, after which stocking was started with the Special grade in the north pile and the Standard in the south pile. This was done for several reasons, but particularly due to the fact that the shipping of Special ore was stopped quite early in the season before the south trestle was ready for use. Apparently the new tubular construction is entirely satisfactory although the final decision on this point must wait until after the piles have been loaded out next summer. If it is, it is planned to request an appropriation for an addition of between 250' and 300' to each trestle, since experience has shown the absolute necessity for a considerable amount of permanent stocking trestle. Building the track out onto the pile will undoubtedly be accomplished without any difficulty but there still remains the need for a place to stock from a permanent trestle while repairs are being made to the track on the pile, and during the loading season.

The grading of the stocking area for both the north and south piles was extended sufficiently for current needs and a collar of mine rock was put in place before stocking was begun. Included in the appropriation for the extensions to the permanent trestles will be a request for additional money to complete the grading and preparation of the stocking grounds.

The experience gained during the year made it possible to decide on the location of the permanent stockpile loading tracks. These locations were agreed upon jointly with the management of the L.S. & I. Railroad Company early in the fall, after which the necessary excavation work was done by A. Lindberg & Sons, Contractors. Late in the year the railroad crew began the work of laying the tracks, which were not entirely completed by the end of the year. The permanent lay-out makes available a stocking capacity of approximately 1,000,000 tons in the two piles. This capacity can later be enlarged considerably by relocating the south track and extending the south area to the east. A second area can be made available north of the Diorite out-crop by spreading out the present north rock pile to form a collar and running a track onto it from the east.

d. Landscaping, Roads, and Parking Area:

Very little new landscaping was done during the year, although a considerable amount of maintenance work was necessary. The new lawns, which were seeded in 1944, grew very well and by the end of the year were well established.

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6. SURFACE:  
(Continued)

d. Landscaping, Roads, and Parking Area: (Continued)

The grading and paving of the roadways and the area between the shop wing and the new storage building was completed in the fall. Some additional work of this nature will be done from time to time as found necessary. This will undoubtedly include a seal coat on some of the pavement which was put in during 1944.

e. Timber Tunnels:

Practically no work was done on the extension of either of the timber tunnels or yards due primarily to a lack of skilled labor and, secondly to the fact that the need for additional timber storage has not yet become acute. It is hoped that during 1946 enough labor will be available to extend the west timber tunnel and complete the driving of the east timber tunnel.

7. UNDERGROUND:

a. Shaft Sinking:

The small amount of work done under this heading was a continuation of the installation of the wire guards between the cage and ladder compartments, and the removal of the old temporary cage runners. A considerable amount of this work remains to be done before the shaft will be entirely complete.

b. Development:

The bulk of development work was done on, and above the 2nd and 5th Levels, with smaller amounts on the 960' and 6th Levels and one small ventilation connection on the 3rd and 4th Levels. Throughout the year this work was done under a number of different E&A's, but by the end of the year it had been decided to put the property on an operating basis by making up a cost sheet covering the operations for the entire year. Main level drifting and raising in ore therefore, comes under the heading "Development in Ore", and produced a total of 32,679 tons.

960' Level:

Included in the footage of main level drifting was a continuation of work on this level. An additional 249' of full size naked rock drift was driven north and east of the old heading in an attempt to by-pass a vug or seam containing water under very high pressure. Subsequently, three holes were drilled from the heading, two of which encountered the old Cleveland Hematite drift. One of these was RX size ( $4\frac{1}{4}$ " diameter), through which most of the water was subsequently handled.

The high pressure concrete dam, with a steel door designed for a pressure of 1,000 lbs. per sq. in., was installed in the original drift approximately 120' from the shaft. This work was done with a model #160 Rex Pumpcrete machine at a fraction of the cost of placing it by hand. Due to delays in delivery



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7. UNDERGROUND:  
(Continued)

b. Development (Continued):

960' Level (Continued):

of this equipment and the Ingersoll Rand 500 G.P.M. centrifugal pumps, pumping from the old mine was not started until the 25th of September. The initial rate was 1,600 G.P.M. with two pumps due to the high pressure in the old mine. By the end of October the pressure head of water had been almost entirely removed and the flow from the old workings had been reduced to approximately 80 G.P.M., which rate of flow continued throughout the balance of the year.

The effect of dewatering the old workings was very satisfactory. During the year the volume handled by the 3rd Level pumping plant increased from 214 G.P.M. in January to 340 during September, with a high of 380 during the first week of that month. By the end of the year this flow had been decreased to 205 G.P.M. and was still decreasing. It is impossible to estimate the extent to which this will increase efficiency in the working areas.

2nd Level and Above:

There was only a small amount of development work above the west end of the 2nd Level, which throughout the greater portion of the year was too wet for successful mining operations. One very pleasing discovery was made during the driving of a ventilation connection between #1 and #2 Cross-cuts. This connection, which was driven entirely in high grade Standard ore, permitted the development of a new stoping area. Operations above, and to the west of #1 Cross-cut were limited largely to attempts to control the water. At the end of the year the water had decreased sufficiently to permit the starting of a new stope development on the -100' sub-level west of Raise #2107.

Two new raises, #2303 and #2406, were put up from #3 and #4 Cross-cuts respectively, to the -60' sub-level. The former was then advanced to the +50' sub-level, and at the end of the year was being continued in Standard ore at the +100' elevation. This development will probably prove very important from a standpoint of mineable Standard ore reserves, but during the current year the area was too wet for efficient mining operations. By December, the water had decreased to the point where plans were being made to reenter the area. Above #4 Cross-cut, raising was continued also to the +50' elevation in Standard ore south of a large dike. Work on this elevation was limited to a small amount of drifting, connecting two additional raises which were put up. Operations in this area were also temporarily discontinued due to the large amount of water which had decreased appreciably by the end of the year.

A third area was developed late in the year from Raises #2502 and #2506 west of #5 Cross-cut on the -85' sub-level. The ore area at this elevation has proved quite extensive and approximately one-half Standard ore and one-half Special. By the end of the year development above this elevation was being continued in a group of six mining raises from the north side of the transfer drift west of Raise #2502.

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7. UNDERGROUND:  
(Continued)

b. Development (Continued):

2nd Level and Above (Continued):

The largest area developed during the year above the 2nd Level extended from #5 Cross-cut east to the Jackson Strip Boundary above #7 Cross-cut. Development of the area along the boundary was started in 1944 by means of three raises put up to the north from the drift east of #7 Cross-cut. The whole area was developed to heights which varied from the top of a small stope at the +10' elevation northeast of #7 Cross-cut, to a low point above Raise #2533 where the jasper capping was encountered on the -100' sub-level. The entire area was developed for sub-level stoping on the upper levels, and sub-level caving beneath the stoping areas. The ore encountered was badly mixed and, in general, the Special grade predominated on the level and the sub-levels immediately above the level. At greater heights, a larger proportion of Standard ore was found in some of the working places. The concentration, which is extremely high in the area above #3 and #4 Cross-cuts, pitches downward very sharply to the east to a low point which is only 40' above the level. From this point the trend is upward above #6 and #7 Cross-cuts to the previously mentioned high at the +10' elevation, or 140' above the level.

A method of loading the tram cars directly from transfer drifts immediately above the main level timber was tried extensively in this area with great success. The method permits the effective handling of any type of material and practically eliminates chute-loading accidents. Unfortunately it cannot be used in all cases particularly where the main level drift, or cross-cut is in soft or broken-up material. The small amount of development in the deposit south of the main east-west dike disclosed nothing but ore which was too high in sulphur for use even in the Special grade.

3rd Level:

The only work done on the 3rd Level was a small size ventilation connection in rock from Raise #5001 to the main level drift west of #1 Cross-cut.

5th Level and Above:

Development on the 5th Level was extensive and, by the end of the year, work had been started on the -535' sub-level from Raises #5104 and #5201. The work done by the end of the year indicated only a small width of ore between the true foot wall and the interbedded slate. From a mining standpoint, this area is further complicated by the presence of a fault between the two cross-cuts.

Drifting on the 5th Level was continued to the east a distance of 200' to a point 50' beyond the main ventilation Raise #5001. The drift was then turned off to the southeast at a point 80' west of the raise and continued to the turn-out for #1 Cross-cut,



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7. UNDERGROUND:  
(Continued)

b. Development (Continued):

5th Level and Above (Continued):

where the drift was again turned in an easterly direction. Meanwhile, the ventilation raise was put up to the 4th Level elevation where a drift was driven 80' to the north, at which point raising was continued to the 3rd Level elevation, where the connection was completed.

In Driving the #1 Cross-cut only 15' of ore was encountered on the footwall and North of the main dike. Beyond the dike 90' of ore were encountered, but this is over-lain by the inter-bedded slates and therefore is not thought to be extensive above the level. Testing in this deposit in Raise #5108 and drifting on the 485' sub-level disclosed no ore above the slate.

Beyond the badly mixed slates, which are about 100' thick, another run of 110' of Standard ore was encountered in a continuation of the cross-cut and subsequent diamond drilling. Development above the level in this area however, showed very little vertical height, but there is a possibility that this deposit may pitch upwards sufficiently to permit mining at some later date.

The main drift was continued to the east to the turn-out for #2 Cross-cut 250' from #1 Cross-cut, and the foot wall contact was encountered 20' from the main drift in contrast with the same contact 260' from the drift in #1 Cross-cut. This condition was later proved to be the result of a major northwest-southeast fault which threw the contact approximately 200' to the north. #2 Cross-cut was driven to the southeast through the fault, and considerably more ore was encountered north of the dike, although some of it was badly mixed as a result of the fault. South of the dike, approximately the same run of ore was encountered underneath the interbedded slate and in this cross-cut no concentration was found beyond the slates although drifting was continued a distance of 180' and diamond drilling was done an additional 145'. In the latter part of the year the development of the deposit between the footwall and the interbedded slate had reached the -535' sub-level at Raise #5104 and #5201. Diamond drilling above #2 Cross-cut south of the dike disclosed ore above the interbedded slate and this area will be developed early next year by raising through the slates into the ore above.

The fault displaced the ore body to such an extent that a continuation of the main drift east of #2 Cross-cut soon encountered the contact, at which time it was decided to turn off slightly to the south and continue drifting in the ore. The original plan was to follow the footwall contact with this ore drift. It soon became apparent that this was impossible due to the sharp, frequent changes in strike and the

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7. UNDERGROUND:  
(Continued)

b. Development (Continued):

5th Level and Above (Continued):

fact that occasional deposits of slate were found in the ore at a considerable distance from the true foot. However, this drift was continued to the east far enough to permit the turn-offs for #3 and #4 Cross-cuts. The information obtained in the main level drift and #3 Cross-cut indicates an ore thickness beneath the interbedded slate of approximately 100', with lean ore and slate continuing to the main dike. Beyond the dike the drift was continued an additional 160' entirely in high grade Standard ore, with the heading still in ore at the end of the year. This is the most encouraging information obtained on the level to date. Apparently the geology has become somewhat less complicated east of the fault. The main drift was continued to the east in ore a short distance around the curve for #4 Cross-cut, with the heading in the interbedded ore at the end of the year.

The irregularities of the foot wall make it impractical to continue the attempt to drift in the ore along the contact. Therefore, it was decided to continue #4 Cross-cut sufficiently around the curve to permit diamond drilling and then move back to the main foot wall drift and continue drifting east of the ventilation raise. This work, which will be started early next year, will provide a permanent rock drift and a ventilation connection for the working places planned for the three cross-cuts. At the turn-out for #4 Cross-cut, where this connection will be made, the main drift will then be turned off somewhat to the north in an attempt to stay well in the foot wall. From what is known of the foot wall rock to date, this main drift will undoubtedly require timbering.

6th Level:

The opening of this new level was resumed late in December of 1944 and continued throughout 1945 with a smaller than normal crew due to the man power shortage and the need for using most of the available men on ore production. In spite of this, the work progressed very satisfactorily to the point where the plats, pockets and tail track drift were completed and the main level drift had been driven around the curve and started to the southeast by the end of December. This new level is considerably different than the others, both as to the size of the plat and the method of car dumping and skip loading. The plat openings, all of which were supported with steel sets, are considerably longer than those on the 5th Level, due to the anticipated need for handling large amounts of timbering supplies. The plat on the skip side is 250' long north of the shaft and wide enough to permit a double track. In contrast with the other levels where the trench method of storage and skip loading is employed, this plat is designed for the direct dumping of the tram cars into the loading pockets. The mine already has three levels which have a large amount of storage capacity in the plat trenches.



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7. UNDERGROUND:  
(Continued)

b. Development (Continued):

6th Level (Continued):

Because of this, it was decided to build this level for direct loading since the storage capacity on the other levels is sufficient for a smooth, continuous hoisting operation. The loaded tram cars will be handled by remote control and it is felt that this method, in conjunction with the other levels which have storage capacity, should prove very efficient and satisfactory. The car dumping equipment was purchased from the Lake Shore Engineering Company, and the installation was practically complete by the end of the year.

Early in January, the sump connecting drift for the new pumping plant will be driven by the present crew, after which drifting to the southeast will be resumed. As soon as skilled men are available, the excavation for the sumps and new pump house will be started.

c. Stoping:

The mining of ore was carried on throughout the year in increasing amounts above the 2nd and 5th Levels, with a production in excess of 29,000 tons being obtained in December. The amount produced by actual stoping operations was 170,412 tons of both grades including stockpile overrun. Throughout the year the cost of mining was charged to E&A NM-34 and the F.O.B. mine value of the ore was credited to the account. By December, a decision having been reached to put the mine on an operating basis for the year, the ore credits were taken out, and the account credited with the "Cost of ore produced during the year 1945 - charged to E&A NM-34". This materially decreased the unexpended balance, which is of no particular moment, since the E&A is now replaced by the operating cost sheet.

By far the bulk of mining operations was carried on in the east portion of the area above the 2nd Level. Early in the year mining above #1 Cross-cut in the west portion was discontinued due to the large flow of water in the working places. By the end of the year this flow had decreased sufficiently to permit reentering the area. Actual recovery of ore above the 5th Level was limited to a small amount of exploratory drifting from two raises above the first two cross-cuts.

Two methods of mining were in use and both proved very satisfactory. Whenever conditions permitted, open sub-level stoping was employed. Beneath the stopes and in areas where ground conditions would not permit stoping, the sub-level caving system of mining was used. This system has been adapted to our conditions in place of top-slicing which is not practical in the flatly dipping deposits, particularly under the interbedded slates. Improvements in the system and increased supervision have, in our opinion, eliminated any additional hazards and undue loss of ore. Throughout the year with both methods, dilution was held to approximately a decrease of 1% in iron and an increase of less than 1% in silica.

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7. UNDERGROUND:  
(Continued)

c. Stoping (Continued):

Above the 2nd Level:

A small amount of mining was done in the early months of the year in two open stopes above #1 Cross-cut. The large amount of water made conditions almost unbearable but operations were continued until other working areas were opened up. Most of the work was a continuation of the large stope which was originally opened from Raise #2107 on the -85' sub-level in 1944. A continuation of this stope up the dip to the northwest brought it above the height of the -35' sub-level. The only other operation in the area west of #1 Cross-cut which produced any ore was a drainage drift which was driven west of Raise #2110 on the -100' sub-level. A raise was put up from the end of this drift and connected with the transfer west of Raise #2108A on the -50' sub-level. This system drained off a large part of the water flowing into the transfer drift, but did not succeed in drying up the territory sufficiently for resumption of mining during the year. By December, however, the area was appreciably drier and a new transfer drift was driven on the -100' sub-level, west of Raise #2107. Stope development above this transfer drift should be completed in time to start mining operations early in 1946.

A small low stope was developed and practically mined out above the connecting drift between #1 and #2 Cross-cuts on the -125' sub-level. The ore recovered from this stope was very high grade Standard ore, but mining operations were handicapped by the hardness of the material and the large flow of water which was encountered shortly after the stope was opened. In spite of this, operations were continued until practically all of the ore had been recovered. This stope furnishes a good example of the extent to which abnormal water conditions can handicap mining operations. While working above the original transfer, the stope was wet, but not unbearably so. One blast opened a crevice and produced a total of 75 G.P.M., which volume was still flowing at the end of the year, which was several months later. Due to this water, it was necessary to drive a second transfer drift north of the jasper so that mining could be continued. This small deposit rose to varying heights above the transfer drift, but at no point was the opening large enough to permit effective mining. As soon as all of the ore had been recovered under the jasper capping, the balance in the vicinity of the second transfer drift was recovered by the sub-level caving method.

Mining operations in the area above #3 and #4 Cross-cuts were limited to the driving of two stope transfer drifts on the -60' sub-level east and northeast of Raise #2406, and a small amount of timbered drifting on the +50' sub-level, connecting the mining raises. Operations in this territory were not continued throughout the latter months of the year due to the fact that the amount of water would not permit



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7. UNDERGROUND:  
(Continued)

c. Stoping (Continued):

Above the 2nd Level (Continued):

efficient recovery, and other drier working places were available. In December Raise #2303B was reentered and, at the end of the year, was up to the +100' elevation still in high grade Standard ore. While the amount of water in this territory has decreased appreciably, there is still too much for efficient mining. A drainage system is planned which may remove most of the water from the working places.

Mining above #5 Cross-cut was limited to exploratory and development drifting between Raises #2502 and #2506 and west of both raises. Test drifts were also driven to the north and south. At this elevation the area was developed in excess of a 300' length and 100' average width, the north half of which is Standard ore and the south half high sulphur. As was previously mentioned, the development of this area was being continued at the end of the year in a series of mining raises.

In the area between #5 and #6 Cross-cuts, mining was limited to the driving of two car loading transfer drifts and a connecting drift between them along the foot wall. The ore, which in this area rises to a height of approximately 40' above the level, will be mined early in 1946. The area between the #2537 and #2631 transfer drifts was almost completely mined out during the year by a sub-level stope above a transfer drift between the two loading transfers. This open stope was limited by the jasper capping to a height of 70' in the east end, and less than 40' immediately above the west end of the transfer drift. By the end of the year stoping had been completed and most of the ore available to the transfer drift had been recovered by sub-level caving.

The area between #6 and #7 Cross-cuts was developed by means of three car loading transfer drifts and raises which were put up to the -50' sub-level, a height of approximately 80' above the level. The raises were connected at this elevation and one fairly successful sub-level stope was developed above this elevation in the central part of the area. To the east and west the ore did not rise to a height which was sufficient for stoping. Mining by the sub-level caving system was finished in this area on the -50' and -75' sub-levels by the end of the year and the initial work of opening the -100' sub-level was started. The sub-level caving system, adapted to our peculiar conditions, was very satisfactory in this area.

Mining in the area between #7 Cross-cut and the Jackson Strip boundary to the east reached a total height of 135' above the level in an open stope developed from Raise #2737. The top operating elevation of this stope was the 0' sub-level, with a small amount of ore being recovered above that elevation.

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7. UNDERGROUND:  
(Continued)

c. Stoping (Continued):

Above the 2nd Level:(Continued)

Mining in this small stope recovered all of the ore in the area lying between the foot wall and the jasper capping down to the -75' sub-level where the original transfer drift was located. The ore on, and immediately above the sub-level was mined by sub-level caving. By the end of the year this operation was completed, as was a second small stope to the south. Mining was being continued by two contracts on the -85' sub-level where a very effective sub-level caving system has been laid out.

In general, the ore in the east end of the mine was badly mixed with the Special grade predominating, particularly on the lower subs. On the upper sub-levels, there was a somewhat greater proportion of Standard ore. In the central and west portions above the 2nd Level the Standard ore predominated, but with every indication of increasing sulphur at lower elevations. The grading of the product to the .050 guarantee was one of the major operating problems during the year.

5th Level and Above:

As was previously mentioned, the recovery of ore on, and above the 5th Level was limited to development work in ore and a small amount of exploratory drifting on the -535' sub-level above #1 and #2 Cross-cuts.

d. Timbering:

Full size main level rock drifting totaled 2,914', of which 2,089' were supported with timber or steel sets. In addition, 93' of drift, driven in 1944 and untimbered, was stripped and timbered. Main level drifting in ore, all of which required timbering, totaled 1,943'. The average direct cost per foot chargeable to timbering was \$4.82, including the additional excavation required, placing of the timber by the drifting crews, and the framing on surface.

The following table records the amount and sizes of timber used on all operations during the year, the average cost-including handling and framing, and the total cost of the material for the year for all operations where timber was used.



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7. UNDERGROUND:  
(Continued)

d. Timbering: (Continued)

Statement of Timber Used - All Operations:

	<u>LINEAL</u> <u>FEET</u>	<u>AVG. PRICE</u> <u>PER FOOT</u>	<u>AMOUNT</u> <u>1945</u>	<u>AMOUNT</u> <u>1944</u>
5'4" Cribbing	79,274	.08062	6,390.91	3,495.75
8" - 10" Stulls	13,829	.14596	2,018.56	913.42
10" - 12" "	22,705	.18480	4,195.93	2,676.80
12" - 14" "	19,474	.23858	4,667.61	893.85
18' Mining Timbers	720	.18222	131.20	38.55
Total	<u>136,002</u>	<u>.12797</u>	<u>17,404.21</u>	<u>8,018.37</u>
Total 1944	78,363	.10234		
		<u>Per 100'</u>		
7' Lagging	847,393	1.4678	12,437.85	5,573.24
9½' Poles	<u>289,463</u>	<u>2.3862</u>	<u>6,907.06</u>	<u>4,555.21</u>
Total	<u>1,136,856</u>	<u>1.7016</u>	<u>19,344.91</u>	<u>10,128.45</u>
Total 1944	499,779	2.0265		
Grand Total -			36,749.12	18,146.82

Considerable experience was gained during 1945 with the use of structural steel in supporting permanent openings where the rotting of timber constitutes a major problem. In 1944 the entire 5th Level plat was supported with steel, using 16 ft. and 18 ft. 8" I-Beams, 23 lbs. per ft., as caps and 4" H-columns, 13 lbs. per ft. as legs. It will probably be expedient in the future to concrete large portions of this plat and leave the steel sets imbedded in the concrete. During 1946 this same system was followed on the 6th Level plat with a change in several areas to a 4" H-column, 13 lbs. per ft., for use as legs. In addition, the tail track drift was supported with the 4"-10 lb. section as legs and the 13 lb. section as caps. Experimenting along this line will be continued for the next several years with the thought that where no particularly heavy conditions are anticipated, steel sets should prove far more effective and economical than treated timber. Preliminary studies indicate that the initial cost is very little, if any greater than the cost of treated timber since the installation expense in the case of steel is much lower. There is no question that the main level rock drifts will eventually have to be retimbered either with treated timber or steel sets.

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7. UNDERGROUND:  
(Continued)

d. Timbering: (Continued)

The following table of the steel used in place of timber is listed as a matter of interest.

	<u>PIECES</u>	<u>EACH</u>	<u>AMOUNT</u>
4" x 4" x 10' H-Columns 10 lbs. per ft. . . . .	287	\$2.81	\$ 806.47
4" x 8" x 16' I-Beams 23 lbs. per ft. . . . .	57	9.40	535.80
4" x 8" x 18' I-Beams 23 lbs. per ft. . . . .	<u>28</u>	10.184	<u>285.15</u>
Total -	372		\$1,627.42

The following table shows the amount, sizes and costs of timbering supplies used in breaking 203,091 tons of ore in stoping and developing in ore.

	<u>LINEAL</u> <u>FEET</u>	<u>AVG. PRICE</u> <u>PER FOOT</u>	<u>AMOUNT</u> <u>1945</u>
5'4" Cribbing	78,261	.08062	6,309.24
8" - 10" Stulls	10,142	.14596	1,480.32
10" - 12" "	20,056	.18480	3,706.47
12" - 14" "	15,885	.23858	3,811.34
18' Mining Timbers	<u>72</u>	<u>.18222</u>	<u>13.12</u>
Total -	<u>124,416</u>	<u>.12314</u>	<u>15,320.49</u>

		<u>PER 100'</u>	
7' Lagging	643,666	1.4678	9,447.61
9½' Tam. Poles	<u>217,576</u>	<u>2.3862</u>	<u>5,191.71</u>
Total -	<u>861,242</u>	<u>1.6998</u>	<u>14,639.32</u>

GRAND TOTAL 1945 29,959.81

Product for year 203,091

Ft. Timber per Ton of Ore	.6126
Ft. Lagging per Ton of Ore	3.1693
Ft. Poles per Ton of Ore	1.0713
Ft. Lagging per Ft. of Timber	5.1735
Cost per Ton for Timber	.0754
Cost per Ton for Lagging	.0465
Cost per Ton for Poles	.0256
Cost per Ton for Timber, Lagging & Poles	.1475



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7. UNDERGROUND:  
(Continued)

d. Timbering: (Continued)

Amount and Cost of Timber Used in 2,089' of Main Level  
Timbered Rock Drift, including 175' supported with steel:

	<u>LINEAL</u> <u>FEET</u>	<u>AMOUNT</u>	<u>AMOUNT PER FT.</u> <u>TRD. DRIFT</u>	<u>LINEAL FT. PER</u> <u>FOOT OF DRIFT</u>
8" - 10" Stulls	3,687	538.24	.281	1.92
10" - 12" Stulls	2,313	427.37	.223	1.20
12" - 14" Stulls	3,559	849.11	.443	1.86
18' Mining Timbers	<u>648</u>	<u>118.08</u>	<u>.061</u>	<u>.34</u>
Total 1945	10,207	1,932.80	1.008	5.32
7' Lagging	173,220	2,542.48	1.216	82.8
9½ Tam. Poles	<u>59,176</u>	<u>1,412.05</u>	<u>.674</u>	<u>28.2</u>
Total 1945	232,396	3,954.53	1.890	111.0
4" x 4" x 10' H-Columns	105 pcs. 2.81 ea.	295.05	1.685	6.0
TOTAL INC. STEEL		6,182.38	2.929	

The above average cost of \$2.93 per foot for timbering supplies compares with \$2.79 per foot in 1944. This increase is due entirely to the increase in the cost of timber. The actual cost for the 175' which was supported with steel sets was \$3.575 per foot. This greater initial cost is more than offset by the fact that, unless crushed by excessive weight, the steel sets will last indefinitely. The timber sets must be replaced in about 5 years.

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7. UNDERGROUND:  
(Continued)

e. Drifting and Raising:

The following table shows all of the miscellaneous drifting and raising during the year, including: main levels, sub-levels, mining and most of the work done on the plats, with the exception of the stripping.

	<u>Drifting</u>		<u>Raising</u>		<u>Total</u>
	<u>Ore</u>	<u>Rock</u>	<u>Ore</u>	<u>Rock</u>	
Large Size	8,181'*	3,952'**	545'	484'	13,162'
Small Size	2,372'	713'	2,984'	581'	6,650'
Total	10,553'	4,665'	3,529'	1,065'	19,812'

\* Timbered

\*\* 2,464' Timbered

In addition to the above, 93' of main level rock drift was stripped and timbered, and 542' of rock drift on the 6th Level plat was stripped and supported with steel sets. The size to which this stripping was done averaged 10 x 17.

The combined total of 20,447' compares with 14,837' in 1944.

Main level drifting and cross-cutting in both ore and rock, timbered and untimbered, totaled 4,857' on the 960', 2nd, 5th, and 6th Levels. In addition to this, 93' of the rock drift driven in 1944 on the 5th Level was stripped and timbered.

Main Level Drifting and Cross-cutting - All Levels:

Untimbered Rock Drifts.....	825'
Timbered Rock Drifts.....	2,089'
Timbered Ore Drifts.....	1,943'
Total.....	4,857'
Rock Drifts Stripped and Timbered.....	93'
Plat Drifts Stripped and Timbered.....	542'

The comparative cost of the above work will be discussed under "8".

The following table shows the amount of development work above the main levels and charged to "Development in Ore" and "Development in Rock".

Large Ore Raise Cribbed.....	545'
Large Rock Raise Cribbed.....	484'
Large Rock Drift Timbered.....	429'
Large Rock Drift Naked.....	84'
Small Ore Raise Cribbed.....	765'
Small Rock Drift Naked.....	635'
Small Rock Raise.....	573'
Total	3,515'

The comparative cost of this work will be discussed under "8".



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7. UNDERGROUND:  
(Continued)

f. Explosives, Drilling and Blasting:

With the exception of the rock immediately north of the plat on the 6th Level, the material encountered in drifting and raising was comparatively easy to break as evidenced by the amount which was timbered. Generally speaking, the ore was somewhat harder than the remainder of the Negaunee District and on the main levels was drilled with the wet drifters rather than the augers.

The following statement shows the total amount of explosives used during the year on all operations.

	<u>Quantity</u>	<u>Average Price</u>	<u>Amount 1945</u>	<u>Amount 1944</u>
Gelamite No. 1	107,294#	11.50 CWT	\$12,338.81	\$ 6,755.56
60% Gelatin Extra	51,450#	11.50 CWT	5,916.75	8,999.67
80% Gelatin Extra	39,816#	14.00 CWT	5,574.24	4,195.80
Total Powder	198,560#	12.00 CWT	\$23,829.80	\$19,951.03
Total Powder 1944	166,972#	11.94 CWT		
Blasting Fuse	453,063'	5.15 M	\$ 2,333.27	\$ 835.16
No. 6 Blasting Caps	60,044	1.22 C	732.53	253.62
No. 14 Duplex Lead Wire	29,750'	18.00 M	535.50	1,098.00
Electric Blasting Caps	26,966	12.42 C	3,349.74	4,481.89
7" Fuse Lighters	7,500	6.75 M	50.64	48.67
Tamping Paper Shells	12,750	6.00 M	76.50	112.80
Master Fuse Shells	3,000	19.88 M	59.64	20.64
#1 Powder Bags	18	1.40 Ea.	25.20	16.80
#2 Powder Bags	28	3.45 Ea.	96.35	127.65
Total Fuse, Caps, Wire, Etc.....			\$ 7,259.37	\$ 7,017.82
Grand Total Explosives & Blasting Supplies.....			\$31,089.17	\$26,968.85

Explosives Used in Driving 2914' of Main Level Rock Drift - All Levels:

	<u>Quantity</u>	<u>Amount</u>	<u>Pounds of Powder Per Foot of Drift</u>	<u>Cost Per Foot</u>
Gelamite No. 1	134#	\$ 15.41		
60% Gelatin Powder	20,253#	2,329.09		
80% Gelatin Powder	24,668#	3,453.52		
Total Powder.....	45,055#	\$5,798.02	15.46	\$1.99
Misc. Blasting Supplies.....		2,031.35		
Grand Total.....		\$7,829.37	15.46	\$2.69

The pounds of powder per foot of drifting and the cost per foot are almost identical with last years rock drifting costs.

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7. UNDERGROUND:  
(Continued)

f. Explosives, Drilling and Blasting (Continued):

Explosives Used in Breaking 203,091 Tons of Ore in Stopping and Development:

	<u>Quantity</u>	<u>Average Price</u>	<u>Amount 1945</u>	<u>Amount 1944</u>
Gelamite No. 1	107,050#	11.50 C	\$12,310.75	\$2,844.52
60% Gelatin Powder	24,155#	11.50 C	2,777.83	51.17
80% Gelatin Powder	2,286#	14.00 C	320.04	-
Total Powder...	133,491#		<u>\$15,408.62</u>	<u>\$2,895.69</u>
Total Powder 1944	25,180#			
<u>Electric Blasting</u>				
Caps	7,144	12.42 C	\$ 887.45	\$ 910.24
No. 6 Blasting Caps	58,928	1.22 C	718.92	63.20
No. 14 Lead Wire	7,750'	18.00 M	139.50	135.00
Paper Shells	12,750	6.00 M	76.50	6.60
Master Fuse Shells	3,000	19.88 M	59.64	10.32
#1 Powder Bags	17	1.40 Ea.	23.80	4.20
#2 Powder Bags	22	3.45 Ea.	75.65	20.70
7" Fuse Lighters	7,500	6.75 M	50.64	28.73
Blasting Fuse	444,488'	5.15 M	<u>2,289.11</u>	<u>297.88</u>
Total Caps, Wire, Fuse, Etc.....			\$ 4,321.21	\$1,487.62
Grand Total Explosives & Blasting Supplies..			\$19,729.83	\$4,383.31
Product.....			<u>1945</u> 203,091	<u>1944</u> 36,430
Pounds of Powder Per Ton of Ore.....			.657	.690
Tons of Ore Per Pound of Powder.....			1.521	1.450
Cost Per Ton for Powder.....			.076	.079
Cost Per Ton for Fuse, Caps, Etc.....			.021	.041
Cost Per Ton for All Explosives.....			.097	.120



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7. UNDERGROUND:  
(Continued)

g. Loading and Traming:

The two original Conway Model 125 electric loading machines worked satisfactorily after being redesigned and rebuilt. Delivery of the third machine was accepted with most of the changes incorporated in it. The Model 40 Eimco-Finley air driven loader also worked satisfactorily after considerable experimenting. After the mechanical defects had been eliminated, this machine was sold to the Cliffs Shaft Mine, since four machines were not needed at this property and the three Conways were kept for the sake of standardization.

As a result of experience gained during 1943 and 1944 the new Lake Shore Engineering Company "Lohed" car has become the standard car for the property. Thirty cars of 100 cu.ft. capacity were received during the year, adapted for use either on the 5th Level camel back dump or the 6th Level cylinder dump. The work of increasing the capacity of the old cars from 90 to 100 cu.ft. was practically completed by the end of the year.

The six General Electric battery locomotives were used throughout the year on all three levels with complete satisfaction. By the end of the year the new Westinghouse Ignitron Converter had been installed and the Westinghouse 8-ton trolley locomotives were in use on the 5th and 6th Levels. This permits using five battery locomotives for traming on the 2nd Level and the sixth for loading the ore trains on the 5th. It will probably be necessary to purchase at least two more battery locomotives in the near future.

h. Ventilation:

The only major addition to the ventilation system was the completion of one of the three connections planned between the 5th and 3rd Levels. This connection was accomplished by means of a raise from the 5th to 4th Level elevation, where a drift was driven to the north a distance of 80'. From this point raising was resumed to the 3rd Level elevation where the connection was completed. Routine tests during the year indicated an average volume of approximately 29,000 cu.ft. per minute, which is entirely satisfactory under our conditions. The ventilation of the mining areas, particularly where the sub-level caving system was employed, presented new problems which were satisfactorily worked out. This system of mining requires better ventilation for the working places since there are numerous occasions when small blasts are necessary.

Continued difficulty was experienced with freezing in the shaft during extremely cold weather. Ice chopping was required on a number of occasions to keep the cage and ladder roads open. No difficulty was encountered with freezing the water supply pipes since the use of city water has been discontinued underground in favor of the supply obtained from several of the drill holes. The planned ventilation connection with the Cambria-Jackson Mine should eliminate all freezing difficulties in this shaft which will then be entirely upcast.

Another problem caused by freezing is the ice from the condensed moisture in the mine air which accumulates in the headframe. One of the several plans for overcoming this difficulty will probably be put into effect in 1946.

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7. UNDERGROUND:  
(Continued)

i. Pumping:

The amount of water handled by the main 3rd level pumping plant increased steadily throughout the first eight months of the year in direct proportion to the increase in the number of underground openings. The theory that a large amount of this water was coming from the old Cleveland Hematite workings was well founded. During 1944 the water increased from 50 G.P.M. in January to 214 in January of 1945. For the next several months the increase was more rapid with an average in September of 340, and a weekly high of 380. The dewatering of the old workings, which was started near the end of September, was accomplished in approximately one month to the point where a steady flow from the old workings of approximately 80 G.P.M. was reached, in contrast with 1,600 while both pumps were running under pressure. The removal of the pressure head in the old mine had an immediate effect on the underground water which by December had decreased to a 205 G.P.M. average, with 200 during the last week of the year.

At the end of the spring break-up in April, the water in the old mine openings was practically at surface, or approximately 1,000' in depth. By September, when the 960' Level pumps were started, this depth had been decreased to approximately 700' by drainage into the mine. The fast rate of discharge completely removed this head in approximately one month. The fairly large capacity of these pumps will probably be needed each spring during the break-up to avoid an accumulation of water in the old mine.

The method of handling the water which accumulated in the shaft and skip pit below the 3rd Level pumping plant was changed during the year, with the excavation of a small sump on the 6th Level plat. The muddy water from the skip pit is pumped to the new sump on the 6th Level by an air driven #7 Cameron pump, and from there pumped to the 3rd Level with one of the small centrifugals which was used during shaft sinking. Throughout the year pumping was limited to two shifts per day and one shift on Sundays and holidays. This was made possible by using the 3rd Level main drift as an auxiliary storage sump.



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

a. Comparative Mining Costs:

Throughout the year up to the end of December, mining was carried on under E&A NM-34 "Recovery of Ore". The success of this operation greatly exceeded the estimate of tonnage; and the cost of operation was considerably lower than anticipated. During December a decision was reached which put the mine on an operating basis for the entire year. This involved taking up the mining costs under E&A NM-34, the items which had been charged to "Development in Ore and Rock" in that same account, and the cost of main level drifting and raising in ore. In addition, the charges which had been made to E&A's NM-10-13 and 10-14, "General Expense" and "Maintenance", were taken up in the cost of operating. The cost of production of \$2.926 per ton, before depreciation and taxes, as shown in the following table, varied from a high of \$5.054 in February with a production of 7,095 tons, to a low of approximately \$2.10 in December with a production of 29,016 tons.

	<u>1945</u>	<u>1944</u>
Product - tons	203,091	54,721
Underground Costs	1.972	
Surface Costs	.438	
General Mine Expense	<u>.516</u>	
Cost of Production -	2.926	
Depreciation	.216	
Taxes	.459	
Loading and Shipping	<u>.034</u>	
Total Cost at Mine -	3.635	
No. of Shifts and Hours	7-1-8 Hr.	29-1-8 Hr.
	292-2-8 Hr.	2-2-8 Hr.
	<u>2-3-8 Hr.</u>	<u>245-3-8 Hr.</u>
Total 8 Hr. Operating Shifts	597	768
Number of Operating Days	298½ 2-8 Hr.	256 3-8 Hr.
Average Daily Product	680	214

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8. COST OF OPERATING (Continued)b. Detailed Cost Comparison:

	<u>1945</u>		<u>1944</u>	
	<u>Amount</u>	<u>Per Ton</u>	<u>Amount</u>	<u>Per Ton</u>
1. Exploring in Mine	1,895.78	.009		
2. Development in Rock	16,061.22	.079		
3. Development in Ore	64,488.65	.317		
4. Stopping	198,853.15	.979		
5. Timbering	46,692.47	.230		
6. Trammig	24,464.22	.120		
9. Pumping	20,846.12	.103		
10. Compressors & Air Pipes	10,497.66	.052		
12. Underground Superintendence	13,672.32	.067		
14. Maint. Comp. & Power Drills	731.97	.004		
17. Pumping Machinery	2,399.00	.012		
Total Undg. Costs -	400,602.56	1.972		
18. Hoisting	34,280.39	.169		
19. Stocking Ore	20,403.07	.101		
21. Dry House	13,301.49	.065		
22. General Surface Expense	7,343.57	.036		
23. Maint. Hoisting Equipment	7,403.77	.037		
25. Top Tram Equipment	1,679.27	.008		
27. Mine Buildings	4,466.77	.022		
Total Surface Costs -	88,878.33	.438		
29. Mining Engineering	5,426.18	.027		
30. Mech. & Elect. Engrg.	1,890.95	.009		
31. Analysis and Grading	19,231.06	.095		
36. Special Exp. Pensions & Allow.	606.62	.003		
37. Ishpeming Office	18,639.98	.092		
39. Mine Office	23,430.11	.115		
28. Insurance	3,741.73	.018		
32. Personal Injury	7,168.60	.035		
38. Social Security Taxes	7,504.44	.037		
Employees Vacation Pay	6,063.43	.030		
Prop'n. of Retroactive Pay- rolls applicable to 1945 operations	11,098.34	.055		
Total Gen. Mine Expenses -	104,801.44	.516		
<u>COST OF PRODUCTION:</u>	594,282.33	2.926		
40. Taxes	93,191.86	.459		

Not on Operating Basis



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8. COST OF OPENING,  
EQUIPPING, &  
DEVELOPING:

During 1945 there was an additional capital investment of \$424,636.69 which brought the grand total to \$3,648,326.84 as of December 31st. No charges were made to E&A's NM-10-13, 14, and 17 since this expense for the year was taken up in the cost of operations. The combined cost in these items prior to 1945 was \$318,223.11, which expense was previously charged to "Negaunee Mine Company Idle Expense". The addition of this item brings the total for opening, equipping, and developing to \$3,966,549.45 as of the end of the year. The taxes for both Section 1 and 2, formerly charged to "General Expense", were taken up in the operating cost sheet.

The following is a summary of the capital expense to the end of the year showing ore credits prior to 1945, and the 1945 expenditures.



8. COST OF OPENING, EQUIPPING AND DEVELOPING:

	E&A REFERENCE	TOTAL AUTHORIZED	TOTAL EXPENDITURES TO DEC. 31, 1945				1945 EXPENDITURES		
			GROSS EXPENDITURES	CREDITS A/C ORE MINED IN DEVELOPMENT	NET EXPENDITURES	UNEXPENDED BALANCE	BEFORE ORE CREDITS	1945 ORE CREDITS	AFTER ORE CREDITS
<b>1. BUILDINGS AND EQUIPMENT:</b>									
a-Main Building . . . . .	(10-10&19)	280,000.00	279,768.02	-	279,768.02	231.98	-	-	-
b-Change House and Shop Equipment . . . . .	10-26 (10-4)	60,000.00	57,003.09	-	57,003.09	2,996.91	15,892.64	-	15,892.64
c-Initial Shop Equipment . .	(10-4A) (10-9)	5,732.73	5,732.73	-	5,732.73	-	-	-	-
d-One 35 Ton Overhead Crane .	(10-9A)	8,894.94	8,894.94	-	8,894.94	-	-	-	-
e-Temporary Equipment	10-18	15,000.00	14,079.62	-	14,079.62	920.38	-	-	-
f-Erecting & Equipping Storage Building . . . . .	31 (10-23)	20,900.00	17,221.24	-	17,221.24	3,678.76	2,118.96	-	2,118.96
g-Compressor Plant . . . . .	10-23A	73,000.00	71,626.13	-	71,626.13	1,373.87	-	-	-
<b>TOTAL . . . . .</b>		<b>463,527.67</b>	<b>454,325.77</b>	<b>-</b>	<b>454,325.77</b>	<b>9,201.90</b>	<b>18,011.60</b>	<b>-</b>	<b>18,011.60</b>
<b>2. SURFACE:</b>									
<b>a-Equipment:</b>									
1-Temporary Surface Plant	10-3	31,130.00	26,506.28	-	26,506.28	4,623.72	-	-	-
2-Truck and Tractor . .	10-1	18,575.00	18,289.42	-	18,289.42	285.58	-	-	-
3-Electric Shovel . . . .	18	85,000.00	81,996.18	-	81,996.18	3,003.82	-	-	-
4-Top Tram Equipment . . .	(10-24) (10-24A)	46,000.00	43,183.13	-	43,183.13	2,816.87	-	-	-
5-Timber Tunnel, Tracks, Pumphouse & Sump . . . .	(1020) (10-20A)	58,000.00	57,867.78	-	57,867.78	132.22	-	-	-
6-Timber Tunnel & Yards .	29	74,800.00	8,914.02	-	8,914.02	65,885.98	539.25	-	539.25
7-Mechanical Addns.-Headframe	32	27,500.00	25,614.99	-	25,614.99	1,885.01	20,796.60	-	20,796.60
<b>TOTAL</b>		<b>341,005.00</b>	<b>262,371.80</b>	<b>-</b>	<b>262,371.80</b>	<b>78,633.20</b>	<b>21,335.85</b>	<b>-</b>	<b>21,335.85</b>
<b>b-General:</b>									
1-Diamond Drilling . . . . .	9	80,000.00	80,091.72	-	80,091.72	91.72	2,153.03	-	2,153.03
2-Moving Two Houses . . . .	10-2	3,458.00	3,458.00	-	3,458.00	-	-	-	-
3-Drainage Well . . . . .	10-11	1,896.00	1,896.00	-	1,896.00	-	-	-	-
4-Road Bldg., Pav., Park Lot. .	25	23,760.00	18,078.26	-	18,078.26	5,681.74	10,999.25	-	10,999.25
<b>Total</b>		<b>109,114.00</b>	<b>103,523.98</b>	<b>-</b>	<b>103,523.98</b>	<b>5,590.02</b>	<b>13,152.28</b>	<b>-</b>	<b>13,152.28</b>
<b>TOTAL SURFACE</b>		<b>450,119.00</b>	<b>365,895.78</b>	<b>-</b>	<b>365,895.78</b>	<b>84,223.22</b>	<b>34,488.13</b>	<b>-</b>	<b>34,488.13</b>
<b>3. SHAFT, HEADFRAME AND TRESTLES:</b>									
a-Sinking in Sand . . . . .	(10-15) (10-15A) (10-16)	16,302.44	16,302.44	-	16,302.44	-	-	-	-
b-Sinking in Rock . . . . .	(10-16A) (10-5)	440,000.00	435,677.44	2,559.15	433,118.29	6,881.71	382.94	-	382.94
c-Shaft Sets . . . . .	(10-5A)	160,975.45	150,624.25	-	150,624.25	10,351.20	-	-	-
d-Headframe Foundation & Ore Trestle	(10-21) (10-21A)	78,000.00	77,417.73	-	77,417.73	582.27	-	-	-
e-Headframe & Trestle . . . .	(10-7:7A)	186,028.83	186,028.83	-	186,028.83	-	-	-	-
f-Extensions to Perm. Stock Trestles	36	40,652.48	34,549.62	-	34,549.62	6,102.86	34,549.62	-	34,549.62
g-Headframe & Power Ho. Equipm.	(10-22&10-22A)	225,000.00	224,451.51	-	224,451.51	548.49	379.62	-	379.62
h-Elec. Equipm. for Cage & Sk. Hsts.	10-8	221,783.00	221,783.00	-	221,783.00	-	-	-	-
i-One Cage Hoist & 1 Skip Hoist	10-6	143,000.00	143,000.00	-	143,000.00	-	-	-	-
j-Elevator for Headframe . . .	10-12&10-12A	4,853.00	4,853.00	-	4,853.00	-	-	-	-
k-Double Deck Cage - spare . . .	37	7,000.00	2,031.10	-	2,031.10	4,968.90	2,031.10	-	2,031.10
<b>TOTAL SHAFT, HEADFRAME AND TRESTLE . . . . .</b>		<b>1,523,595.20</b>	<b>1,496,718.92</b>	<b>2,559.15</b>	<b>1,494,159.77</b>	<b>29,435.43</b>	<b>36,584.04</b>	<b>-</b>	<b>36,584.04</b>

No 1945 Ore Credits account of operating cost sheet



8. COST OF OPENING, EQUIPPING AND DEVELOPING:  
(Continued)

	E&A REFERENCE	TOTAL AUTHORIZED	TOTAL EXPENDITURES TO DEC. 31, 1945				1945 EXPENDITURES		
			GROSS EXPENDITURES	CREDITS A/C ORE MINED IN DEVELOPMENT	NET EXPENDITURES	UNEXPENDED BALANCE	BEFORE ORE CREDITS	1945 ORE CREDITS	AFTER ORE CREDITS
<b>4. UNDERGROUND:</b>									
<b>a-Plant:</b>									
1-Pumping Plant - 3rd Level	(10-25A)	55,000.00	52,731.20	-	52,731.20	2,268.80	-	-	-
2-Pumping Plant - 6th Level	39	128,700.00	28.64	-	28.64	128,671.36	28.64	-	28.64
Total -		183,700.00	52,759.84	-	52,759.84	130,940.16	28.64	-	28.64
<b>b-Equipment:</b>									
1-Mining Equipment . . . . .	19	44,550.00	40,956.69	-	40,956.69	3,593.31	2,416.00	-	2,416.00
2-Mining Equipment . . . . .	28	51,700.00	36,525.19	-	36,525.19	15,174.81	25,456.11	-	25,456.11
3-Haulage Equipment . . . . .	(10-29)	110,000.00	102,943.89	-	102,943.89	7,056.11	6,513.71	-	6,513.71
4-Haulage Equipment . . . . .	(10-29A)	90,420.00	73,756.29	-	73,756.29	16,663.71	31,300.30	-	31,300.30
5-Underground Substations . . . . .	38	14,300.00	-	-	-	14,300.00	-	-	-
Total -		310,970.00	254,182.06	-	254,182.06	56,787.94	65,686.12	-	65,686.12
<b>c-Development:</b>									
<b>1-Main Level Development:</b>									
Plats and Pockets . . . . .	(10-28)	220,000.00	216,488.03	-	216,488.03	3,511.97	52,834.10	-	52,834.10
Drifting . . . . .	(10-27)	680,271.20	649,608.44	80,404.67	569,203.77	111,067.43	123,360.05	-	123,360.05
Ventilation & 2nd Outlet	26-27	23,100.00	8,022.74	-	8,022.74	15,077.26	8,022.74	-	8,022.74
2-Development & Mining	(24-26)	203,728.80	194,487.12	49,921.83	144,565.29	59,163.51	33,099.78	-	33,099.78
above Levels . . . . .	27-34)	25,000.00	24,739.12	-	24,739.12	260.88	4,886.32	-	4,886.32
3-Underground Exploration . . . . .	21	1,152,100.00	1,093,345.45	130,326.50	963,018.95	189,081.05	222,202.99	-	222,202.99
Total -		220,000.00	216,488.03	80,404.67	144,565.29	59,163.51	33,099.78	-	33,099.78
d-Dewatering Hematite Workings	30	66,000.00	63,984.67	-	63,984.67	2,015.33	47,635.17	-	47,635.17
TOTAL UNDERGROUND -		1,712,770.00	1,464,272.02	130,326.50	1,333,945.52	378,824.48	335,552.92	-	335,552.92
GRAND TOTAL BEFORE CONTINGENCIES		4,150,011.87	3,781,212.49	132,885.65	3,648,326.84	501,685.03	424,636.69	-	424,636.69
Plus 10% for Contingencies		228,217.26	-	-	-	228,217.26	-	-	-
GRAND TOTAL INCLUDING CONTINGENCIES		4,378,229.13	3,781,212.49	132,885.65	3,648,326.84	729,902.29	424,636.69	-	424,636.69
General Expense . . . . .	10-13	-	271,716.98	-	271,716.98	-	-	-	-
Maintenance . . . . .	10-14	-	37,050.73	-	37,050.73	-	-	-	-
Building Roads & Landscaping . . . . .	10-17	-	9,455.40	-	9,455.40	-	-	-	-
TOTAL to Negaunee Mine Company		-	318,223.11	-	318,223.11	-	-	-	-
Idle Expense . . . . .		-	-	-	-	-	-	-	-
GRAND TOTAL . . . . .		4,378,229.13	4,099,435.60	132,885.65	3,966,549.95	729,902.29	424,636.69	-	424,636.69

No 1945 Ore Credits account of operating cost sheet.



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8. COST OF OPENING,  
EQUIPPING &  
DEVELOPING:  
(Continued)

Once again comparative cost accounting was done on both types of main level drifting and cross-cutting, although the cost of the ore drift was ultimately taken into the operating cost sheet. The decrease in the operating schedule from three to two shifts per day had the effect of increasing the distributive cost per foot. In spite of this increase the total cost of the work decreased due to the great efficiency of the two-shift operation and an increase in the average accomplishment per man day.

Untimbered Rock Drift.....	825'
Timbered Rock Drift.....	2,089'
Timbered Ore Drift.....	<u>1,943'</u>
Total.....	4,857'
Stripping & Timbering.....	93'

	Actual Per Foot	Timbering & Labor Per Foot	Total Per Foot	Distribu- tive Charges Per Foot	Grand Total Per Foot	1944 Grand Total Per Foot
Untimbered Rock Drift - 825'....	\$21.87	-	\$21.87	\$ 7.42	\$29.29	\$34.15
Timbered Rock Drift -2,089'....	24.24	\$4.61	28.85	13.64	42.49	46.84
Timbered Ore Drift -1,943'....	22.89	5.07	27.96	12.90	40.86	45.27
Stripping & Timbering - 93'..	8.25	4.09	12.34	6.98	19.32	14.73

The total expenditure for the above work was \$211,803.47. The charges for the ore drift were ultimately taken up in the "Cost of Operation".



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8. COST OF OPENING,  
EQUIPPING, &  
DEVELOPING:  
(Continued)

The following table shows the comparative cost of all miscellaneous drifting and raising other than small naked ore drifts and raises which were charged directly to stoping. As compared with the previous year there was a large increase in the cost per foot for cribbed raising both in ore and in rock. This was due entirely to the fact that most of the raising was done parallel to the structure of the ground and most of the material encountered was very poor. From experience gained to date most of the raising at this property will be quite expensive.

Cost of Miscellaneous Sub-level Development Work:

		<u>Direct</u> <u>Per Foot</u>	<u>Overhead</u> <u>Per Foot</u>	<u>Total</u> <u>Per Foot</u>	1944 <u>Total</u> <u>Per Foot</u>
Small Ore Raise					
Cribbed.....	765'	\$10.61	\$1.52	\$12.13	None
Small Rock Drift					
Naked.....	635'	7.11	2.45	9.56	\$9.20
Small Rock Raise..	573'	8.00	2.60	10.60	9.20
Large Ore Raise					
Cribbed.....	545'	18.61	7.53	26.14	18.45
Large Rock Raise					
Cribbed.....	484'	18.04	7.19	25.23	22.55
Large Rock Drift					
Timbered.....	429'	15.64	7.76	23.40	47.77
Large Rock Drift					
Naked.....	<u>84'</u>	8.53	6.12	14.65	35.08
	3,515'				

The total cost of the above work was \$59,150.96. The cost of the cribbed ore raises was ultimately taken up in the cost sheet under "Development in Ore".

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9. EXPLORATIONS  
AND  
FUTURE  
EXPLORATIONS

There was no new surface drilling in Section 2 during the year, the last hole, #53, having been completed in 1944. A small amount of work was done, however, in concreting two of these surface holes in an effort to stop the water which was seeping into the working places. This work, which was done in Hole #49 and #51, was only partially successful. Several weeks after the water in #49 had been stopped, it again started to flow, apparently due to caving in the jasper capping.

Underground exploratory drilling was not extensive during the year due to the necessity of using the drill men on the 960' Level and on other work. Approximately two-thirds of the drilling for the year was on the 960' Level in the dewatering of the old Cleveland Hematite workings. With the exception of Holes #18 and #19, which were RX size (4 $\frac{1}{4}$ " diameter), these holes were put in in an attempt to locate the old drift. This was finally accomplished in Hole #17. Hole #18 was then drilled but the starting dip could not be maintained and the hole passed under the drift. Hole #19 encountered the drift as planned and served to dewater the workings.

With the exception of #24, which is being drilled from the end of #7 Cross-cut on the 2nd Level, all of the drilling was confined to relatively short holes in advance of main level drifting and development work on the 5th Level. Hole #24, which was started late in December, is being drilled in an effort to obtain additional information about the ore deposit which was cut at the 2nd Level elevation in Surface Hole #39. This hole will be approximately 1,000' in depth.

The following table is a record of the year's underground drilling, including the work on the 960' Level.



MATHER MINE EXPLORATION  
YEAR 1945

NO.	LOCATION	DIRECTION	DIP	DATE		MATERIAL	FINISHED DEPTH
				STARTED	FINISHED		
13	1st Level (960')	N33°34'E	0°	1/15/45	1/29/45	0 - 58' Soft Ore Jasper	385'
				Continued	3/15/45	3/31/45	
14	1st Level (960')	Due North	+1°	4/20/45	4/27/45	0 - 261' Hard Blue Jasper and Soft Ore Jasper	261'
15	1st Level (960')	N16°E	+1°	5/2/45	5/11/45	0 - 160' Blue Jasper 160 - 298' Soft Ore Jasper	298'
16	5th Level	S19°E	+5°	6/2/45	6/14/45	0 - 15' Blue Ore 15 - 135' Ore, Soft Ore Jasper 135 - 199' Blue Jasper	199'
17	1st Level (960')	N60°E	+4°	6/29/45	7/9/45	0 - 156' Blue Jasper 156 - 191' Soft Ore Jasper - old workings.	191'
18	1st Level (960')	N60°E	+4° RX(4¼")	7/31/45	8/29/45	0 - 24' Blue Jasper 24 - 30' Blue Jasper 30 - 73' Soft Ore Jasper 73 - 168' Soft Ore Jasper 168 - 215' Soft Ore Jasper	215'
19	1st Level (960')	N50°E	+4½° RX(4¼")	8/31/45	9/24/45	0 - 61' Blue Jasper 61 - 159' Soft Ore Jasper 159 - 210' Soft Ore Jasper - old workings.	210'

MATHER MINE EXPLORATION  
YEAR 1945

Continued

<u>NO.</u>	<u>LOCATION</u>	<u>DIRECTION</u>	<u>DIP</u>	<u>DATE</u>		<u>MATERIAL</u>	<u>FINISHED DEPTH</u>
				<u>STARTED</u>	<u>FINISHED</u>		
20	5th Level	S.0°46'W	+4°	10/26/45	11/5/45	0 - 40' Transition Jasper & Slate 40 - 130' Soft Ore Jasper 130 - 142' Blue Jasper	142'
21	5th Level	Due South	+3°	11/10/45	11/20/45	0 - 16' Dike 16 - 17' Soft Ore Jasper 17 - 105' Ore	105'
22	5th Level	S.19°	+42½°	11/28/45	12/5/45	0 - 13' Cased 13 - 62' Slate Jasper 62 - 109' Soft Ore Jasper	109'
23	5th Level	Due South	+45°	12/11/45	12/26/45	0 - 7' Cased 7 - 52' Ferruginous Slate 52 - 87' Transition Slate & Jasper 87 - 135' Ore 135 - 172' Soft Ore Jasper	172'
24	2nd Level	S.34°E	0°	12/27/45		0 - 79' Soft Ore Jasper	



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9. EXPLORATIONS  
AND  
FUTURE  
EXPLORATIONS  
(Continued)

The drilling cost on the 960' Level totaling \$15,408.40 for 1,560' was charged to E&A NM-30 and is not included in the following cost comparison. All other drilling, totaling 806' was charged to E&A NM-21 "Underground Exploration", the cost of which is detailed below:

	<u>1945</u> <u>Expenditures</u>	<u>Cost</u> <u>Per Foot</u>	<u>Cost Per</u> <u>Foot 1944</u>
<u>Equipment:</u>			\$ .013
 <u>Drilling Costs:</u>			
Labor.....	\$1,164.31	\$1.444	1.888
Miscellaneous Supplies & Diamond Drill Carbon.....	2,218.67	2.753	2.518
Diamond Drill Rental.....	2.50	.003	.098
Total.....	<u>\$3,385.48</u>	<u>\$4.200</u>	<u>\$4.404</u>
 <u>Overhead Expense:</u>			
Analysis.....	135.41	.168	.512
Geological.....	174.27	.216	.097
D. D. Supt.....	19.86	.025	.000
Social Security.....	25.96	.032	.048
Total.....	<u>\$ 355.50</u>	<u>\$ .441</u>	<u>\$ .657</u>
 Grand Total.....	 \$3,740.98	 \$4.641	 \$5.074

A supplement to NM-21 for the continuation of long range underground drilling has been requested in the amount of \$10,000.00. All drilling of a local nature in advance of mining operations will be taken up in the cost of operating.

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10. TAXES:

The Mather Mine valuation was increased from \$1,800,000.00 in 1944 to \$2,000,000.00, although the tax rate was decreased slightly. The amount of taxes increased from \$64,802.33 to \$71,886.97.

The above taxes, which were paid to the City of Ishpeming, were taken up in the operating cost sheet in December and, in addition, the taxes for Section 1, 47-27 in the City of Negaunee were also taken up. This addition of \$21,304.89 brought the total to \$93,191.86. As shown in the table below, the tax rate is considerably higher in the City of Negaunee.

	1945			1944		
	<u>VALUATION</u>	<u>RATE</u>	<u>TAXES</u>	<u>VALUATION</u>	<u>RATE</u>	<u>TAXES</u>
Section 2, 47-27, except the N 600' of NE of NE and the Rights of Way						
Real	\$1,770,000.		\$63,608.84	\$1,695,000.		\$61,001.86
Personal	230,000.		8,265.56	105,000.		3,778.88
Total -	<u>\$2,000,000.</u>	<u>\$35.9372</u>	<u>\$71,874.40</u>	<u>\$1,800,000.</u>	<u>\$35.9893</u>	<u>\$64,780.74</u>
Coll.Fee	-	-	-	-	-	-
Total -	<u>\$2,000,000.</u>	<u>\$35.9372</u>	<u>\$71,874.40</u>	<u>\$1,800,000.</u>	<u>\$35.9893</u>	<u>\$64,780.74</u>
Mather Mine Pipe Line, parcel in Section 3, 47-27	\$ 350.	\$35.9372	\$ 12.57	\$ 600.	\$35.9893	\$ 21.59
Total Mather Mine (Sec.2, City of Ishpeming)	\$2,000,350.	\$35.9372	\$71,886.97	\$1,800,600.	\$35.9893	\$64,802.33
Jackson Section 1, 47-27	\$ 500,000.	\$42.1879	\$21,093.95	-	\$41,7692	-
Coll.Fee 1%	"	.4219	210.94	-	.4177	-
Total Section 1 (City of Negaunee)	<u>\$ 500,000.</u>	<u>\$42.6098</u>	<u>\$21,304.89</u>	<u>-</u>	<u>\$42.1869</u>	<u>-</u>
GRAND TOTAL -	\$2,500,350.		\$93,191.86	\$1,800,600.		\$64,802.33

	1945	
	<u>Tons</u>	<u>Per Ton</u>
Taxes per ton produced	203,091	\$0.459
Taxes per ton shipped	168,205	\$0.554



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11. ACCIDENTS  
AND  
PERSONAL  
INJURY:

There were five compensible accidents during the year and although none of them were particularly serious, the days lost aggregated 322. Days worked totaled 60,110, hours 480,886 with a frequency rate of 10.39 per million man hours, and a severity rate of .670 days per thousand man hours. These rates compare with an average of 14.74 and 1.860 for all operations of the company, including the open pits and the power company. In the underground operations the Mather was third in both severity and frequency, the average for underground mines being, frequency 19.00 and severity 2.560. The following is a brief summary of the accidents for the year, the details of which may be found in the monthly reports.

<u>DATE</u>	<u>NAME</u>	<u>NATURE OF INJURY</u>
3/19/45	Samuel W. Sapila	Cut tendons right wrist.
6/27/45	John Nigra	Compound fracture of 2nd, 3rd and 4th metatarsals of left foot.
8/25/45	Lauri Poutanen	Broken arch left foot.
8/30/45	John Mattonen	Internal injuries, not serious.
10/24/45	Samuel Racine	Fractured wrist, sprained ankle.

12. NEW CONSTRUCTION  
AND PROPOSED  
NEW CONSTRUCTION:

New construction on surface during the year was not extensive, being limited to a small amount of work in the main buildings and the virtual completion of the wiring and equipping of the new storage building. One new building was started. This structure, which is on a rock fill at the top tram elevation between the north and east rock piles, will be used as a permanent repair shed for the top tram cars. The present "hot room" in the headframe is needed during the winter to thaw the operating cars and is not available for repair purposes. The only new building contemplated in the immediate future is a frame structure to house the power sawmill which will be put into service sometime in 1946.

Other new construction projects planned for the near future are the extensions to the permanent stocking trestles, the extension of the west timber yard and the construction of the east timber tunnel and yard.

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13. EQUIPMENT AND  
PROPOSED  
EQUIPMENT:

Comparatively large amounts of equipment were purchased during the year and a considerable amount was on order at the end of the year. Surface equipment, which was charged to E&A NM-10-26, included, besides miscellaneous shop items, the purchase of the new Rex Model #160 Pumpcrete Machine and a 2 yd. concrete mixer for use with the large truck. This equipment proved invaluable for the large concrete jobs during the year, particularly the dam on the 960' Level and the piers and columns for the permanent stocking trestles. Underground, the saving in handling costs is from \$10.00 to \$15.00 per cu. yd. and on surface, at least \$5.00. With the large amount of concrete work planned for the future, this equipment is practically indispensable.

New equipment underground included the purchase of thirty new 6-ton "Lohed" cars equipped for dumping either by camel back or cylinder, and miscellaneous mining equipment. By the end of the year the purchase of authorized equipment for the first 20 mining contracts was practically completed, with a considerable amount on order for delivery early in 1946 when a request for an additional authorization will be made. It costs approximately \$50,000.00 to equip 10 mining contracts with scraper hoists, scrapers, drill machines, timber hoists, etc.

Included in the equipment charges for the year was the major portion of the expense of changing over the AC scraper hoist motors. The original standard torque motors are all being replaced with high-slip, high-torque, punch-press type motors which are much more satisfactory for scraper hoist service. The ultimate torque of the new motors is 5 times the rated speed as compared with 2.5 to 2.8 on the original motors. The ability to "pull-out" is of utmost importance in scraper hoist work in soft ore.

The Westinghouse Ignitron Set, which was delivered and charged out during 1944, was erected and put into service late in the year in the room excavated for it north of the 5th Level Plat. This machine, which is designed to furnish DC power for the underground main line haulage locomotives, was operating successfully at the end of the year. The three 8-ton Westinghouse trolley locomotives have now replaced battery locomotives for use in areas where direct current is now available.

14. MAINTENANCE  
AND REPAIRS:

During the year routine maintenance of equipment, main buildings and grounds was carried on. The largest single item was the replacement of the steel pipe lines in the cooling system which protects the motor generator sets and compressors. The entire cooling system had become badly corroded by some algae in the water supply. Iron oxide in the form of sludge accumulated and settled in remote parts of the system where the circulation was the slowest. This condition was noticed early in the year, and the steel pipes were replaced with copper tubing. The necessary measures were also taken to correct this situation and prevent its recurrence. This work was carried on throughout the year on week-ends and other days when the machinery was not in operation.



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15. POWER:

	<u>CONSUMPTION</u> <u>K.W. HOURS</u>	<u>AVERAGE</u> <u>MAX. DEMAND</u>	<u>AVERAGE</u> <u>DEMAND FACTOR</u>	<u>COST OF</u> <u>CURRENT</u>	<u>AVERAGE PRICE</u> <u>PER K.W. HOUR</u>
1945-	4,720,000	1,245 K. W.	43%	\$69,566.20	\$0.0148
1944-	3,893,000	965 K. W.	46%	56,121.80	.0144
1943-	2,785,000	600 K. W.	48%	39,725.80	.0142
1942-	1,510,830	325 K. W.	47%	23,448.14	.0155

There was a sharp increase in both the total consumption and the average maximum demand during the year and a subsequent rate increase of .0004 per kilowatt-hour. The increase in demand is due to the impracticability of limiting the power load while hoisting. Throughout the year both the cage and skip hoists were run from the large motor generator set, the small one being run infrequently as a maintenance precaution. The equipment for simplifying the change-over from one set to the other was received during the latter part of the year and the installation will be made sometime during 1946.

16. WATER SUPPLY:

	<u>CONSUMPTION</u>	<u>COST</u>	<u>COST PER</u> <u>THOUSAND GAL.</u>
1945 -	7,628,800	\$710.71*	\$ .093
1944 -	5,205,200	481.82	.092
1943 -	4,868,000	446.64	.092
1942 -	2,487,000	231.36	.093

\* Includes the \$14.00 charge for unmetered lawn sprinklers.

There was also a marked increase in the consumption of water which is furnished by the City of Ishpeming. This was due largely to the increase in the number of men since city water is no longer used in the underground operations.

The cost of installing a new water main approximately one-quarter of a mile along the north side of U.S. 41 was shared by the company due to the responsibility for draining the existing water supply in old mine openings, which for years have been used by the residents in the locality.

18. NATIONALITY  
OF EMPLOYEES:

	<u>American</u> <u>Born</u>	<u>Per</u> <u>Cent</u>	<u>Foreign</u> <u>Born</u>	<u>Per</u> <u>Cent</u>	<u>Total</u>	<u>Per</u> <u>Cent</u>
American	15	6.9%	-	-	15	6.9%
English	24	11.0	9	4.1%	33	15.1
Finnish	65	29.8	13	6.0	78	35.8
Canadian	6	2.7	-	-	6	2.7
Swedish	26	11.9	2	.9	28	12.8
Norwegian	8	3.7	1	.5	9	4.2
German	2	.9	-	-	2	.9
Irish	2	.9	1	.5	3	1.4
Danish	1	.5	-	-	1	.5
Italian	14	6.3	6	2.8	20	9.1
French	19	8.7	-	-	19	8.7
Manx	1	.5	-	-	1	.5
Dutch	2	.9	-	-	2	.9
Austrian	-	-	1	.5	1	.5
Total -	185	84.7%	33	15.3%	218	100.0%

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1. GENERAL

The production of 238,855 tons was the lowest in any year since 1934. The sharp drop since the high record of 437,853 tons in 1943 was the result of continued loss of manpower combined with temporary non-use of the sub level stop method of mining. The number of men probably reached a low point of 160 in December with an upward trend expected and four new sub level stopes were being developed above the 9th Level, assuring improvement of production and operations early in 1946.

Development drifting extended ore limits to within 70' of the Lloyd Mine boundary line on the 9th Level, and three of the four new stopes were being developed in this area on the fee land southeast of the shaft. Later in the year a width of over 200' of ore was disclosed on the -220' sub in the south central portion of Chase Lease #9, with the effect of further improving the ore reserve position on this lease.

The average pumping rate from the deep wells on surface was 361.5 GPM above that of 1944, and this had the effect of lowering the water table over the mine workings an additional 4'-3" as well as decreasing the water pumped from underground from an average of 895 GPM to 858. The combined cost of surface and underground pumping, however, was higher in proportion and far above the average of other mines in the district because of the lower production in 1945.

The fee land proportion of the product declined from 21% to less than 16% due mainly to concentration of mining on the leases, and development work on the fee lands after the month of April. With mining operations expected to start in several of the new stopes shortly after the first of the year, production from the fee lands is expected to show a sharp increase.

2. PRODUCTION  
SHIPMENTS &  
INVENTORIES

a. Production

<u>Grade</u>	<u>Tons</u>	<u>Percent of</u> <u>Total</u>
Morris Standard	175,121	73.4
Morris Silicious	63,734	26.6
Total	238,855	100.0
Total last year	308,953	



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2. PRODUCTION  
SHIPMENTS &  
INVENTORIES (Cont.)

The 1945 production came from fee and leased lands in the following proportions:

<u>Grade</u>	<u>Fee</u>	<u>Lease</u>	<u>Total</u>
Morris Standard	30,208	144,913	175,121
Morris Silicious	7,465	56,269	63,734
Total	37,673	201,182	238,855
Percent of Total	15.8%	84.2%	

The percentage figures compare with 20.9% and 79.1% respectively last year. The maximum proportion of ore from the fee lands to date was 48.1% in 1936, and the minimum 11.4% in 1941. A summary of the total production since the Inland Steel Company acquired the Morris Mine lease starting with 1933, or over a 13 year period, is listed below:

	<u>Tons</u>	<u>Percent</u>
Lease ore product 1933-1945	2,951,980	75.3%
Fee ore product 1933-1945	968,719	24.7%
Total 1933-1945	3,920,699	100.0%

b. Shipments

The tonnage of ore forwarded from the mine reached a high point in 1943, with decreases occurring in each of the last two years. The 1945 total was divided as follows:

<u>Grade</u>	<u>Pocket Tons</u>	<u>Stockpile Tons</u>	<u>Total Tons</u>
Morris Standard	102,515	73,173	175,688
Morris Silicious	37,301	32,179	69,480
Total	139,816	105,352	245,168

The above total tonnage comprised shipments of 38,032 tons of fee, and 207,136 tons of lease ore.

A table showing shipments from the mine in each of the past five years, and the fact that those in 1945 were the lowest for the period, is as follows:

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2. PRODUCTION  
SHIPMENTS &  
INVENTORIES (Cont.)

<u>Year</u>	<u>Standard Ore</u>	<u>Silicious Ore</u>	<u>Total Tons</u>
1945	175,688	69,480	245,168
1944	236,764	83,169	319,933
1943	316,805	125,394	442,199
1942	307,101	89,670	396,771
1941	270,211	64,052	334,263

A summary of shipments since the Inland Steel Company acquired the lease shows:

	<u>Tons</u>
Standard Ore Shipped 1933-1945	2,995,992
Silicious " " 1933-1945	<u>890,672</u>
Total	3,886,664

c. Ore in Stock

The stockpile balance on December 31st, shown below, compares with a total of 40,351 tons last year.

<u>Grade</u>	<u>Tons</u>
Morris Standard	27,752
Morris Silicious	<u>6,288</u>
Total	34,040

The decrease was largely accounted for by the silicious grade which was down from 12,036 tons to the 6,288 tons shown above.

e. Production by Months

<u>Month</u>	<u>Days</u>	<u>Morris Standard</u>	<u>Morris Silicious</u>	<u>Total Tons</u>	<u>Tons per Man per Day</u>
January	24½	16,108	4,312	20,420	4.68
February	24	14,016	3,068	17,084	4.00
March	27	19,570	6,716	26,286	5.57
April	25	18,485	4,692	23,177	5.30
May	26	19,222	4,280	23,502	5.17
June	26	17,585	7,018	24,603	5.47
July	25	14,887	6,392	21,279	5.01
August	24	12,241	4,741	16,982	4.21
September	21½	10,200	4,463	14,663	4.06
October	25	11,338	9,136	20,474	4.90
November	20½	12,029	4,068	16,097	4.91
December	20½	9,440	4,848	14,288	4.36
Total	289	175,121	63,734	238,855	4.80 Avg.



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2. PRODUCTION  
SHIPMENTS &  
INVENTORIES (Cont.)

The continued loss in men, from 220 in January 1944 to 178 in January 1945 and 160 in December 1945, the fact that there were no sub-level stoping operations and the reduced working schedule were all reflected in the downward production trend of the table above. The average tons per man figure of 4.80 compared with 5.70 in 1944 and 6.37 in 1943. The low point was probably reached in December with a reversal of the first two factors expected early in 1946.

The working schedule in effect during 1945 was as follows:

2 shifts - 5½ days per week - January 1st to January 24th  
2 shifts - 6 days per week - January 24th to September 1st  
2 shifts - 5½ days per week - September 1st to December 31st.

f. Delays

There were no production or hosting delays reported in 1945.

3. ANALYSIS

Shipments

The combined dried analyses of ores sampled and analyzed by the Inland Steel Company in 1945 were as follows:

<u>Grade</u>	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Moist.</u>
Morris Standard	175,688	59.42	.080	8.02	.53	2.72	11.66
Morris Silicious	69,480	51.73	.079	18.27	.41	3.42	11.21

Natural Analysis of Ore in Stock Dec. 31, 1945

	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Moist.</u>
Morris Standard	27,751	52.09	.076	7.52	.46	11.70
Morris Silicious	6,289	46.79	.079	14.44	.35	11.20

Expected Natural Analysis of Ore Reserves

	<u>Tons</u>	<u>Iron</u>	<u>Phos.</u>	<u>Sil.</u>	<u>Mang.</u>	<u>Alum.</u>	<u>Sul.</u>	<u>Moist.</u>
Morris Standard	3,825,674	52.27	.067	7.92	.45	2.47	.013	11.70
Morris Hi-Sulphur	181,853	52.17	.095	7.25	.40	2.27	.400	10.50



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4. ESTIMATE OF  
ORE RESERVES

The estimated total ore reserve on December 31st, 1945, using a factor of 12 cu. ft. per ton and allowing deductions for rock and loss in mining, was, 4,007,527 tons. This figure represents a decrease of 126,932 from the 4,133,932 ton estimate of December 31st, 1944, but converts to an increase of 48,716 tons from that date when the mining of 175,121 tons in 1945 is taken into account. The increase of 48,716 tons resulted from the disclosure of extensions of No. 33 orebody above the 9th Level on Chase Lease #9 in the amount of 109,372 tons, the addition of 37,245 tons of high sulphur ore to the fee land estimate at the east end of the 9th Level, offset by the loss of 82,193 tons of standard ore in this same area by reason of jasper separating what was thought to be one orebody into the two narrower deposits on the footwall and fault dike a short distance above the 9th Level.

While the above fact was unfortunate from the standpoint of reserves on the fee lands, it disclosed two ore bodies which presently seem ideally suited to employment of the lower cost sub level stoping system of mining, with resulting benefit expected for the mining company.

The following table shows a summary of the ore reserve estimate by leases with a list of the changes that were explained above that occurred during during the year:

Description	Estimate 12-31-44	1945		Actual Est. Dec. 31, 1945	Inc. or Dec. over 1944 Est.
		Product Standard	Estimate Deducting Product		
Chase Lease #9	2,068,825	99,069	1,969,756	2,079,128	109,372
Chase Lease #24	327,180	45,844	281,336	265,628	15,708
Chase Lease #24 High Sulphur	144,608	-	144,608	144,608	None
Chase Lease #25	33,273	-	33,273	33,273	"
Chase Lease #26	26,140	-	26,140	26,140	"
Total Chase Lease	2,600,026	144,913	2,455,113	2,548,777	93,664
C.C.I.Co.Lands	1,533,906	30,208	1,503,698	1,421,505	82,193
D.C.I.Co.Lands High Sulphur				37,245	37,245
Total C.C.I.Co. Lands	1,533,906	30,208	1,503,698	1,458,750	44,948
Grand Total	4,133,932	175,121	3,958,811	4,007,527	48,716



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5. LABOR &  
WAGES

The decline in number of men working at the mine continued through 1945 with an average of 178 men in January, 170 in July and 160 in December. The return to work of World War II veterans held the total stationary in November and December, with every indication pointing toward an increase in the crew during 1946.

Basic wage rates continued unchanged, but a March 23rd directive of the WLB ordered shift differential premiums, and increased holiday and vacation provisions, all of which were included in a new contract with the CIO union signed in Ishpeming August 18th. Shortly thereafter, following the end of the war, the union supposedly reopened the wage question, but a difference in the date of actual notification delayed a strike vote on this question until December 31st, when the Morris employees voted 99 to 22 in favor of going out on strike January 14, 1946 if necessary to enforce the union's demand for a wage increase of \$2.00 per day. Inland countered the wage demand on November 26th by notifying the union of withdrawal from the still unexecuted contract of August 18th because of the union's unreasonable delay in the signing and returning of the contract by the national officers, and secondly because the power of the WLB to make and enforce orders ended with the surrender of Japan. The Company stated, however, that it desired to bargain further with the union with respect to the clauses required by the WLB March 23rd directive.

The check-off of union dues was discontinued by the Company following notice of withdrawal, and the last of the 1945 series of events occurred when the union appeared before the NLRB requesting a hearing and accusing Inland of unfair labor practice with consequent threat to "union security".

6. SURFACE

There were no special changes or improvements to the surface plant during the year.

A fire occurred in March in the welding shop next to the surface dry, which caused several hundred dollars damage to the building and the same on the contents of the building. The cause was first thought to be sparks that had been left from welding operations but since the time of occurrence was eleven o'clock at night, it was rather thought to have resulted from electrical wiring within the building. The Ishpeming Fire Department was called and brought the fire under control within a few minutes after their arrival.



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6. SURFACE (Cont.)

Surface Pumping

Deep well pumping continued in holes 1,2,3A, 4, 5, 6, 8, 9 and 10. Well No. 4 was pumped dry in May and the pump removed on the 12th of that month. Small pumps also operated in Mud Lake and the two caves when sufficient water collected during the warmer months to enable efficient running. The pumping rate in Well No. 10, which started operating in December 1944, was largely responsible for increasing the average total surface rate from 2243 GPM in 1944 to 2605 GPM in 1945.

Due to the facts that no new wells were developed, and that operating repairs were lower than normal, the surface drainage operating expense was considerably below that of last year, even though the amount of water handled increased. The comparison is shown below:

	<u>1944</u>	<u>1945</u>
Avg. surface pumping rate GPM	2243.94	2604.56
Operating expenditures	\$ 41,859.00	\$ 22,105.00
Cost per ton of ore produced	\$ 0.135	\$ 0.093

The record of pumping rates at the various wells and the two caves is shown below in tabular form:

	<u>Jan.</u>	<u>Feb.</u>	<u>March</u>	<u>April</u>	<u>May</u>	<u>June</u>
Pump No. 1	Down	330	320	295	280	250
2	90	88	78	78	72	72
3A	480	450	435	455	455	445
4	50	50	50	50	Dry	Dry
5	282	270	275	250	240	240
6	100	100	100	100	100	50
8	440	440	440	340	345	345
9	243	226	228	205	192	205
10	1040	940	835	645	630	760
Cave No. 1	-	-	20	20	20	20
Cave No. 2	-	-	100	40	40	40
Average	2823	2964	2848	2664	2599	2427
	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
Pump No. 1	280	270	270	250	210	210
2	68	70	70	63	62	60
3	132	146	163	173	173	178
3A	395	390	395	395	390	385
5	225	227	227	226	206	200
6	50	50	50	50	50	Down
8	380	375	385	388	382	357
9	178	195	190	195	195	192
10	740	725	705	690	670	660
Cave No. 1	20	20	20	20	-	-
Cave No. 2	40	40	40	40	-	-
Average	2525	2519	2519	2481	2401	2308



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6. SURFACE (Cont.)

The deep well pumping described above was effective in lowering the average water table over the mining area 4'-3-3/8" in comparison to 2'-10-3/8" in 1944. The total decrease in head of water on the ledge since surface pumping was inaugurated in March 1937 amounted to 56'-10-1/8" on Dec. 31st, as measured in the test holes in sand and gravel on the ledge. The following table lists these holes and records the changes in water level during the year and for the entire period:

Test Hole	Drop in Water Level		Depth Remaining to Ledge
	Year 1945	August 1937 to December 1945	
504	11'-1"	82' - 3-5/8"	66' - 6"
505	3'-5"	48' - 3-5/8"	82' - 9-5/8"
506	-	-	-
507	-	123' - 10-3/4"	None
508	1'-6"	67' - 1-1/4"	66' - 6"
509	4'-5"	77' - 4-3/4"	112' - 3-5/8"
510	5'-2"	35' - 9-5/8"	87' - 9-5/8"
511	3'-0"	27' - 9-5/8"	126' - 3-5/8"
512	11'-2-1/2"	50' - 2-3/8"	110' - 10-3/4"
513	11'-5"	36' - 6"	129' - 9-5/8"
514	3'-9"	28' - 6"	98' - 4-3/4"
515	0'-2"	18' - 9-5/8"	109' - 9-5/8"
516	8'-6"	30' - 8-3/8"	12' - 9-5/8"
517	2'-0"	21' - 7-1/4"	90' - 6"
518	0'-6"	28' - 8-3/8"	80' - 10-3/4"
519	7'-2"	52' - 7-1/4"	106' - 1-1/4"
520	-	50' - 7-1/4"	None
521	-	32' - 0"	None
522	-	89' - 11"	7' - 11"
523	-	78' - 0"	4' - 8-3/8"
524	-	-	-
526	4'-3"	11' - 1-1/4"	102' - 10-3/4"
527	3'-5"	8' - 1-1/4"	66' - 10-3/4"
528	3'-5"	2' - 3-5/8"	97' - 2-3/8"
531	6'-7"	7' - 10-3/4"	68' - 9-5/8"
532	8'-2"	12' - 3-5/8"	71' - 9-5/8"
533	13'-9"	16' - 7-1/4"	115' - 6"
534	0'-1"	0' - 7-1/4"	94' - 7-1/4"
Peronto Wells	-	9' - 4-3/4"	None
Avg.	4'-3-3/8"	56' - 10-1/8"	



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7. UNDERGROUND

a. Pumping

The initial Morris Mine surface cave occurred in March 1939, and the following year the water entering the mine reached a high of 1157 GPM. By 1942 this quantity had declined to 844 GPM., then came a temporary increase to 931 in 1943, followed by a decline to an average of 858 GPM in 1945. The variations in the quantities by levels were similar to those in 1944 in that decreases on the 7th and 8th Levels were partially offset by an increase on the 4th Level due probably to extension cracks over the mining areas tapping additional surface water, and to extension of development and mining on the 9th Level with consequent drainage increases.

A review of the gallons per minute pumped on the various levels by months through 1945 follows:

	4th Level	6th Level	7th Level	8th Level	9th Level	Total
January	159.0	43.6	143.3	242.2	272.4	860.5
February	158.9	44.7	143.3	257.3	275.7	879.9
March	168.2	42.0	136.9	242.9	262.1	852.1
April	167.2	39.5	140.1	242.2	259.9	848.9
May	157.0	39.5	144.5	249.4	267.6	858.0
June	153.3	41.1	150.7	248.6	260.5	854.3
July	154.4	43.6	150.0	245.1	266.0	859.1
August	155.1	45.3	156.1	257.0	254.7	868.2
September	153.3	43.6	153.3	240.7	261.0	851.9
October	157.8	43.6	150.0	242.2	259.5	853.1
November	158.8	43.6	144.4	236.1	276.2	859.1
December	157.9	43.6	140.1	229.2	278.9	849.8
1945 Average						857.9

The underground pumping expense amounted to \$61,036, a slight increase from the figure of \$59,219 last year even though the quantity of water was less. A comparison of the surface, underground and total pumping expense and cost per ton produced for the last three years is shown in the following table:

Year	Surface Pumping Optg. Expense	Underground Optg. Exp.	Total Pumping Optg. Expense	Cost per ton of ore produced
1945	\$ 22,105	\$ 61,036	\$ 83,141	\$ .349
1944	41,859	59,219	101,078	.327
1943	20,134	58,521	78,655	.180



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7. UNDERGROUND (Cont.)

The average cost of pumping of 34.9¢ per ton exceeded normal figures, and compares with costs ranging from 4¢ to 12¢ for other mines in the district. Increased production in 1946 may be expected to bring this cost more in line.

Several breaks occurred in the water discharge column due to settlement of the timber shaft sets above the 4th Level. Steel bearers were placed to take the load of the column off the timber sets, and also to arrest timber settlement. Tamarack props and fir lath were also used in the shaft repair work.

b. Development

The number of development contracts was double that of the year 1944, and work was concentrated on and above the 9th Level. Drifting was completed near the Lloyd Mine boundary line at the east end of the 9th Level in March, and under the central portion of #33 deposit in February. These same two contracts, with the addition of several others, then spent the balance of the year in exploratory and development raising between the 8th and 9th Levels. Development work throughout the year continued in ore and lean ore so that for the second successive year no rock was hoisted from the Morris Mine.

Raise development above the east end of the 9th Level in May disclosed a separation of the ore body in this vicinity, with one limb of the deposit rising along the north footwall and the other along a dike trending southwesterly from its point of intersection with the footwall near the Lloyd Mine boundary line. Exploration and development in the south limb by the end of the year disclosed this ore rising to a height of 45' above the 8th Level and proved widths ranging from 60' to 75' in a north-south direction. Development of the north limb at the east end of the deposit, while not as far advanced, indicated the same type of ore formation extending to the east a short distance into the Lloyd Mine property. Three contracts worked in this area steadily with the intention of bringing three new sub level stopes into operation as early as possible in 1946. The first one expected to enter the production stage is that of No. 1 contract, whose double transfer drift was opened on the -220' sub in the south limb.

Following the completion of the 9th Level drift under the central portion of #33 deposit, two new double compartment raises were advanced from the south side of this drift, one of these, #915, reaching the 8th Level elevation late in the year. Development of the east central portion of #33 ore body was then continued by Nos. 5 and 10 contracts on sub levels from the -200' to the -240'. The -220' intermediate sub level connecting drift to the top slice workings farther west was advanced to connect these two areas, and from the east end of this drift on the 1850 W.

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7. UNDERGROUND (Cont.)

coordinate line, a 245' small size exploratory drift disclosed a 220' width of ore on this section. This drift intersected a few small seams of jasper and one 6' dike, but the north-south width of ore outlined is considerably in excess of that on subs above and was responsible for the larger share of the ore reserve increase on this lease. Late in the year, No. 10 contract completed the transfer drift for a fourth new stope at a distance of 130' west of #920 raise in the downward extension of #75 deposit to the north of #33 deposit.

A resumé of the development work during 1945 as described above therefore shows in general that development drifting in ore on the 9th Level was completed during the first quarter. This was followed by double compartment raising to the -220' intermediate sub level and then by development drifting in search of areas that could be developed for sub level stoping. The work entered a third stage during the latter portion of the year when small drift and raise development with the subs at 20' intervals, had progressed to the point where actual stoping operations will be underway early in the new year. Nos. 1, 6 and 30 contracts were engaged in this work on various sub levels above the east end of the 9th Level in December, together with Nos. 5 and 10 contracts in the east central portion of #33 deposit above the same level.

c. Stoping

Mining operations continued on Chase Lease #24, Chase Lease #9, and the Fee Lands to the south and east. The vertical extent of the actual mining operations ranged from the 40' sub above the 8th Level to the -190' sub. The mine product, which averaged somewhat less than 20,000 tons per month, resulted from an average of 13 mining contracts, together with the ore resulting from the development work described above.

The mine product and efficiency in general were below that of the last several years due to the fact the product was entirely dependent upon top slicing and sub level caving operations, and the continued shortage of men necessary to service these mining operations properly. This shortage was particularly serious from the standpoint of timber supply, in that the miners in addition to their regular work in many cases were necessarily responsible for supplying themselves with all timber needed in their mining operations. The return to at least a portion of the product resulting from sub level stoping operations early in 1946 will relieve this condition by releasing company account men to properly serve the reduced number of top slicing contracts.



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7. UNDERGROUND (Cont.)

A modified system of sub level caving was adopted after the month of June in the workings in the northwest portion of the mine in #75 deposit on Chase Lease #24. Three contracts in this area were mining on sub levels 20' apart in an ore body averaging 40' in width. A detailed description of mining operations follows:

Chase Lease #24

Four contracts were mining on this lease during the greater portion of the year. Three of these, as mentioned above, used the sub level caving method of mining in the west portion of #75 deposit on subs from the 40' to the -30' under the former stopes in this territory. At the end of the year #22 contract was slicing and caving south of #807 raise on the -10' and -20' sub levels. The initial slices were advanced through the small dikes occurring in this area on the -20' sub and an additional 25' width of ore disclosed south-west of the raise. Mining operations of #21 contract east of #806 raise advanced a greater than normal distance in this direction, and during the last few months of the year extended on to the west portion of lease #9 in #75 deposit. The ore body at this point is only two slices wide and retreating with the sub level caving system had mined a length of 90' on Chase Lease #9 on the -10' and -20' subs. #4 contract at the extreme west end of #75 deposit, continued top slicing and caving operations under their former stope, completed mining on the -20' sub and in December cut out the raise and advanced the initial drift on the -30' sub.

#9 contract also continued top slicing under their former stope near the corner formed by the boundary of Chase Leases 24 and 9, and the Fee Lands. Mining had been discontinued in this stope late in 1945 due to the wet conditions then prevailing, but slicing beneath and west of the stope area progressed under normal conditions throughout 1945. An area some 100' x 65' was mined on each of the -100' and -110' subs, being completed at the latter elevation at the end of the year.

The top slicing operations of #16 contract from their raise on the Fee Land at times extended west across the boundary line into Chase Lease #24. This mining was in the southwest corner of #33 deposit and was bounded on the west side by the fault dike, so a triangular shaped area was mined on the -150' to -170' sub levels.

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7. UNDERGROUND (Cont.)

Fee Lands

Mining operations, aside from the large amount of development work done above the east end of the 9th Level, were restricted to the part time operations of three contracts. #7 contract continued top slicing east of their raise on the -10' and -20' subs above the 8th Level at the east end of #33 deposit. In December this contract had completed three slices under the jasper hanging wall which retreated approximately 20' to the west on each sub level due to the dip of the jasper.

The second contract working part time on the fee lands was #25 contract who mined on the -150' and -160' subs in the southwest portion of #33 deposit. This contract was in the narrower portion of the ore body separated by the dike adjacent to the east-west fee land boundary line, and because of wet conditions the mining progress was slow and discouraging. The climax was reached in July, when water pressure released suddenly through the ore at the east end of one of the slices, very nearly resulting in serious accident. The men noticed the sets were subjected to increasing pressure and started down the raise when a rush of water and ore caught them and washed them a distance of 50' to the level below. One man suffered a broken arm and the second a broken rib. Re-entry to this sub level had been effected by the end of the month but the quantity of water entering the working place increased to such an extent it was decided to stop mining on this elevation until such time as #16 contract had completed mining in the area farther west. The radial slicing of #16 contract was completed at the -150' and -160' subs early in the year and in December was turning in this direction on the -170' sub, and will extend out toward the former workings of #25 contract in hopes proper drainage of this area may be effected.

Chase Lease #9

The top slicing operations of the several contracts on this lease extended from the -20' sub above the 8th Level in #75 deposit to the -190' sub above the 9th Level in #33 deposit. The lease furnished a larger than normal proportion of the yearly mine product, due to the fact that an average of seven of the thirteen mining contracts were fairly consistently employed here.

Nos. 14 and 15 contracts continued top slicing in the central portion of #75 deposit on sub levels from the -20' to the -60'. Mining was completed at the latter elevation in October, when one of these contracts was disbanded in order to make up the shortage of miners in several other contracts, and the second of the two was transferred to development work. Nos. 3 and 8 contracts continued top slicing in the