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14. MAINTENANCE AND REPAIRS

In November 1942 an inspection of the East 10" Crusher revealed two cracks in the main frame. This piece of equipment had crushed 266,990 tons of ore to that date. The frame was inspected by Mr. William Knight of the Allis Chalmers Co,, from whom the equipment had been purchased in February 1941, who recommended that the frame be replaced by one of cast steel construction rather than of cast iron as constituted former practice.

For purposes of record the history of the two 10" Crushers is recorded briefly here:

East 10" Crusher

Purchased for the Maas Mine in 1926 and transferred to the Tilden Mine in 1928. The main frame cracked in Nov. 1940 after crushing 1,024,027 tons. New frame purchased from Allis-Chalmers in Feb. 1941 and showed two cracks in Nov. 1942 after crushing 266,990 tons. The inspection by an Allis-Chalmers representative and recommendations made are given above.

West 10" Crusher

Purchased new from Allis Chalmers in 1928 and the main frame broke in May 1939 after crushing 865,816 tons.
A replacement frame was obtained from the Empire Mine in June 1939 and is in service to date.

A description of repairs made to Tilden Mine Equipment during the month of December is outlined below:

42" Crusher: inspected eccentric and removed drive shaft and bearings.
10" Crushers: cleaned and assembled bolts on crusher motors.
Cleaned and assembled car dump motor. Built up drum on car dump hoist.
Finished repairing No. 2 and No. 3 locomotive tenders. Removed two front bearings on No. 3 locomotive.

15. POWER

Electric power was entirely satisfactory during the year and occasioned little delay, except as was set forth under "DElays", the power was shut off during severe electrical storms to avoid the possibility of the circuit breaker throwing out while the crushers were under load.

16. WATER SUPPLY

The water supply was satisfactory and ample for all property needs throughout the year, including the washing which was done after stripping with the bulldozer on the North side of the East Pit.

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

18. NATIONALITY OF EMPLOYEES

	American Born	Foreign Born	Total
English	17	5	22
Swedish	6		6
Finnish	6	4	10
Irish	4		4
Czech	1		1
Total	34	9	43

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1. GENERAL:

The Athens Mine operated on a schedule of three shifts per day for five days per week and two shifts on the sixth day or Saturday during the entire year. Whenever conditions in the mine were more favorable and there was a surplus of broken ore available near the end of the week, hoisting was continued overtime on the Saturday afternoon shift. The hours of overtime worked depended upon the amount of ore available and varied from two hours to a full eight-hour shift in which case a midnight shift hoisting crew consisting of skip tenders and a motor crew underground and top landers and hoisting engineers on surface would be ordered to report for work.

The above operating schedule was maintained throughout the year with the exception of interruptions due to delays the most serious of which occurred in July when several coils on the Ilgner motor generator set in the engine house burned out. The mine was idle from July second to Sunday night, July 12th, during which time the motor was sent to Milwaukee for repairs and returned. The production in 1942 of 681,748 tons was the largest in the history of the mine and exceeds the production in 1941 by 32,998 tons. Delays due to breakdowns of equipment occuring during the year prevented a production of 700,000 tons from being reached which approximates the maximum hoisting capacity of the shaft. Shipments in 1942 were 672,225 tons and also were the largest in the history of the mine, exceeding the previous largest tonnage shipped in 1940 by 4,216 tons.

The main problem resulting from the heavy operating schedule is the maintenance and repairs of equipment to reduce delays to a minimum. This is particularly true of skip roads in the shaft where in addition to the regular week-end inspection and repairs, the mid-week inspection which was instituted in 1941,has been continued to minimize the possibility of serious breakdowns. The mid-week inspection is made during the change of shifts on Thursday mornings and the value of the inspection has been proven on a number of occasions as discovery has been made of broken steel members and points of excessive wear which had developed during the period between inspections. Immediate repairs were made which caused short delays but serious breakdowns in the shaft were averted.

The development program during the year has been confined mainly to the 4th level which was reopened for resumption of mining late in 1940. New mining areas are being developed East of block four under the hanging above the fourth level and as the outline and extension of the ore areas were disclosed a number of new raises were required. The jasper hanging is very irregular and the first sub levels mined under the hanging have been relatively small and necessitate drilling and blasting the jasper to form a cushion of filling above subsequent subs. Development of areas for mining has been concentrated near the North and South footwalls where the ore has been found to extend to the highest elevations and the first subs in these areas were developed 175 feet and 150 feet respectively above the fourth level. Late in the year development was started of another area near the North footwall at a height of 220 feet above the level. The ore extends to higher elevations further to the East and development of the area East to the Lucky Star boundary is planned for the near future upon completion of negotiations with the Jones & Laughlin

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1. GENERAL: (CONT.)

regarding an agreement as to the mining limit that will be established at the boundary line. In connection with development of the latter area for mining the height of the ore (approximately 300 feet above the the fourth level) at the boundary makes it advisable to consider an intermediate level, as the length of raises from the fourth level to reach the top of the ore would be beyond the limits of good mining practice.

To maintain the maximum production schedule mining was done from the fourth, sixth, seventh, eighth and ninth levels. Mining in Block four above the sixth level is approaching the level elevation and in a short time all the ore mined in this block will be transferred to the seventh level. During the year mining was resumed on the eighth level as mining in an area in Block three north of the dike approached the seventh level elevation. Additional ore will be transferred to this level during the year as mining above the seventh level progresses to lower elevations and development of a new cross-cut and raises is completed on the eighth level.

During 1943 the tenth level will be reopened for mining the Block two area which is at present being mined from the ninth level. Mining is this area has now reached an elevation of about fifty feet above the ninth level leaving about two additional sub levels that can be mined from this level. Some additional rock drifting will be required on the tenth level to enable raises to be put up into the block two area. Incidentally mining in a portion of the above area has been seriously hindered by the large amount of water encountered along the footwall side of the ore body. Also in portions of several other mining areas at higher elevations in Block three and Block four operations have been hindered due to wet conditions. By means of drainage drifts to intercept the water before it enters the ore area and pipe laid in the floor of completed slices in the wet areas it has been possible in few instances, to drain a large portion of the water away and improve conditions in adjacent workings.

In connection with the problem of improving conditions in the wet mining areas it was also decided to attempt to locate the source of ground water entering the mine through the surface caves by drilling test holes to ledge on surface in the area surrounding the cave. In August a contract was made with the Layne-Northwest Company for the churn drill work which consisted of drilling a total of seven test holes, six inch in diameter, and two well holes twelve inch and fifteen inch in diameter respectively. The holes varied in depth from 57 feet to 134 feet and all the test holes excepting one, and the well holes were drilled to varying depths into the fractured ledge formation. The holes are located South and Southwest of the surface cave. Permission was received to drill two of the holes on the Jones and Laughlin's Breitung Hematite property. A favorable amount of water was encountered in three of the test holes and in each case the water was encountered mostly in the fractured ledge formation below the sandy surface material. These holes provided information for the location of the wells the first of which was a twelve inch well drilled to a depth of 134 feet and into which a deep well pump has been installed and put into operation in October and is discharging the water into Partridge Creek which is nearby. At the present time the pump is delivering about forty-five gallons per minute and as a result the ground water level is being gradually lowered in the area surrounding the well. A second well

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1. GENERAL: (CONT.)

fifteen inch in diameter is also completed but the pump which is ordered for the well has not been received. This well hole was chambered in the ledge by blasting to provide a larger reservoir for water because the pump to be installed in this well will operate intermittently.

No immediate effects on the amount of water pumped from the mine has occured due to the Pumping in No. 1 well. However, the gradual lowering of the ground water level in the area adjacent to the surface cave is an indication that over a longer period of time the effects of the surface deep well pumping will result in a decrease in the water entering the mine.

During the year there has been an extension of the area of surface settling to the East and also to the South above the mined areas in Blocks two, three and four. A new break in the surface has occured to the South of the break which occured last year. The latter break is located approximately 250 feet South of the limit of mining along the South footwall and crossed three lots in the Gaffney Field location on which houses are located. Early in January, 1943 it was deemed advisable to have these three houses vacated and removal of the houses from the lots will be undertaken in the Spring of the year.

The safety record in 1942 was not quite as good as in the previous year. The total number of compensable accidents in 1942 was sixteen as compared with eighteen in 1941, more of the 1942 accidents however, caused loss of time of one to four months than in the previous year. There were no fatal accidents during the year, two caused loss of time of more than four months, nine caused loss of time of one to four months and five caused loss of time of less than one month. The heavy operating schedule maintained during the year accounts for 8,259 more man days worked than in the previous year.

2. PRODUCTION, SHIPMENTS AND INVENTORIES:

a. Production by Grades:

	1942	1941	Increase
Athens Ore	504,271	478,330	25,941
Mitchell Lease Ore	177,477	170,420	7,057
Total Ore	681,748	648,750	32,998
Rock	20,690	20,630	60
Total Hoist	702,438	669,380	33,058

b. Shipments:

Grade of Ore	Pocket Tons	Stockpile Tons	Total Tons	Total Tons 1941
Athens Ore	341,686	159,224	500,910	477,545
Mitchell Lease Ore	111,417	59,898	171,315	181,906
Total	453,103	219,122	672,225	659,451
Total Last year	389,436	270,015	659,451	
Increase	63,667		12,774	
Decrease		50,893		

Shipments increased 1.94% in 1942 and were 9,523 tons less than the product for the year.

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2. PRODUCTION, SHIPMENTS AND INVENTORIES:

c. Stockpile Inventories:

Grade of Ore	Dec. 31, 1942	Dec. 31, 1941	Increase
Athens Ore	42,794	39,433	3,361
Mitchell Lease Ore	17,886	11,724	6,162
Total	60,680	51,157	9,523

d. Division of Product by Levels:

The ore hoisted from the various levels was as follows:

	1942		1941	
	Tons	Percent	Tons	Percent
4th Level	135,564	19.9	59,660	9.2
6th Level	57,426	8.4	148,105	22.8
7th Level	327,023	48.0	291,867	45.0
8th Level	32,165	4.7		
9th Level	129,570	19.0	149,118	23.0
Total	681,748	100.0	648,750	100.0

There was a large increase in the production from the 4th level due to a number of new mining areas that were developed above the level in 1942. Abandoning a large portion of the 6th level due to approach of mining operation in Block 4 accounts for the decreased production on this level as compared with the previous year and an increase on the 7th level. Tramming on the 8th level was started when mining in a portion of Block three was abandoned from the 7th level raises due to the approach of mining operations.

e. Production by Months:

Month	Athens	Mitchell	Total	Rock
January	43,609	15,793	59,402	1850
February	37,799	18,152	55,951	1685
March	39,689	17,005	56,694	3420
April	40,529	13,999	54,528	3340
May	42,295	12,454	54,749	1960
June	46,924	13,788	60,712	850
July	54,546	7,829	42,375	1290
August	47,546	12,992	60,538	1800
September	45,892	14,456	60,348	1315
October	47,512	14,153	61,665	720
November	38,965	17,004	55,969	1290
December	38,965	17,004	55,969	1170
Total 1942	504,271	174,629	678,900	20,690
Current Year's Stple Overrun		2,848	2,848	
Total 1942	504,271	177,477	681,748	20,690
Total 1941	478,330	170,420	648,750	20,630
Increase	25,941	7,057	32,998	60

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

f. Ore Statement:

	Athens	Mitchell	Total	Total 1941
On hand Jan. 1, 1942	39,433	11,724	51,157	51,696
Product for Year	504,271	174,629	678,900	617,558
Prior years stockpile Overrun				10,162
Current Years Stockpile Overrun		2,848	2,848	31,192
Total	543,704	189,201	732,905	710,608
Shipments	500,910	171,315	672,225	659,451
Balance on Hand	42,794	17,886	60,680	51,157
Increase in Output			61,342	
Inc. ore on hand			9,523	

g. Delays

January 5th - 15 Hours Delay - Loss of Product 1600 tons

The indicator on skip hoist went out of order and no hoisting could be done until the necessary repair parts were obtained and installed.

January 15th - 3 Hours Delay - Loss of Product 210 tons

A broken stringer in the skip roads was discovered during the day shift operations necessitating installing a new runner.

April 13th - 2 Hours Delay - Loss of Product 170 tons

A broken stringer in the skip roads was discovered during the midnight shift operations and a two hour delay occured while it was replaced.

April 15th - 2 Hours Delay - Loss of Product 170 tons

A broken stringer in the skip roads was discovered during the midnight shift operations and two hours were required to install a new runner.

April 24th - 3 Hours Delay - Loss of Product 300 tons

A head frame sheave was removed due to a broken shaft at the start of operations on the day shift and a new sheave installed.

July 2nd to 13th - 184 Hours Delay - Loss of Product 16,000 tons

Several coils burned out on the induction motor on the skip hoist Ilgner set and it became necessary to send the unit to Milwaukee for repairs. No hoisting could be done and the mine was idle on this account until the midnight shift on the twelfth when operations were resumed after the repaired unit was returned and installed.

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

g. Delays

July 22nd - 2¾ Hours Delay - Loss of Product 250 tons

Some accumulated mud in skip pit caused the skip to strike the dirt in skip pit pocket and prevented hoisting until it was cleaned out.

Ausgust 28th - ¾ Hour Delay - Loss of Product 75 tons

Replacing worn out liners in one of the head sheaves during the day shift operations accounted for this delay.

September 28th - 1½ Hours Delay - Loss of Product 150 tons

One of the pulley stand sheaves jammed during the afternoon shift operations and to prevent excessive wear on the hoisting rope it was removed and replaced with another sheave.

October 5th - 24 Hours Delay - Loss of Product 2,400 tons

A broken steel shaft set was discovered late during the previous days shaft inspection and also excessive wear had taken place on the face of the runners near the broken set. The mine did not operate for 3-8 hour shifts while the broken set was repaired and several hundred lineal feet of new runners were installed.

October 22nd - 2¾ Hours delay - Loss of Product 290 tons

It was necessary to make repairs to several badly worn runners in the South skip road where excessive wear had taken place.

November 12th - 1¾ Hours Delay - Loss of Product 150 tons

Repairing several badly worn runners in the South skip road during afternoon shift in a section of the circular shaft.

December 10th - 1½ Hours Delay - Loss of Product 150 tons

Repairing worn runners on North skip road in a section of the circular shaft.

December 11th - 3¼ Hours Delay - Loss of Product 300 tons

Repairing worn runners in North skip road where excessive wear had taken place.

December 12th - 1½ Hours Delay - Loss of Product 150 tons

During the day shift operations it was necessary to remove one of the skips and install the spare skip as inspection showed that the skip needed repairs.

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

g. Delays: (Cont.)

December 31st - 8 Hours Delay - Loss of Product 750 tons

Two of the spiders which hold the skip rope drum on the shaft had become loose on the shaft and being of solid construction they could not be tightened other than by the key ways but this method did not prove successful. Therefore two new split spiders were ordered and delivered to the mine and arrangements made for installing the new spiders during the New Years week end. It was estimated that four days would be required to complete the work so to provide the necessary time the mine was not operated, on December 31st when only the day shift was scheduled to work. Installation of the new spiders was completed during the first week of 1943.

A summary of the delays excluding Delays due to lack of current in 1942 shows a total loss of product of 23,115 tons in 256¾ hours, or equivalent to about ten and one-half days operation. This compares with 26,775 tons loss in product in 1941, a total of 283¼ hours of delay. The delay of 184 hours, caused by burning out of several coils on the Ilgner motor generator set was the most serious delay occuring during the year and the numerous delays caused by repairs in the skip roads accounts for the major portion of the other delays.

h. Delays from Lack of Current:

May 13th - 2 Hours Delay - Loss of Product 150 tons

Due to a severe electrical storm there was an interruption to the electric power causing a two hour delay.

November 16th - 1¾ Hours Delay - Loss of Product 50 tons

A sleet storm interrupted the electric power service causing a two hour delay.

The total loss of product due to delays from lack of current during 1942 amounted to 200 tons as compared with a loss of 380 tons from the same cause in 1941.

3. ANALYSIS:

a. Average Mine Analysis on Output:

	1942				1941			
Grade	Tons	Iron	Phos.	Sil.	Tons	Iron	Phos.	Sil.
Athens	504,271	60.18	.115	7.45	478,330	60.17	.124	6.97
Mitchell	177,477	60.22	.115	7.39	170,420	60.09	.122	7.17

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3. ANALYSIS: (CONT.)

a. Average Mine Analysis on Output: (Cont.)

There was very little change in the grade of the output as compared with the previous year. The heavy operating schedule makes it necessary to excercise careful supervision over the progress of mining to maintain the grade due to the rapid daily advance in the mining places.

b. Average Analysis on Straight Cargoes:

Grade	Mine	Lake Erie
Athens	None	None
Mitchell Lease	None	None

c. High Sulphur Ore:

No high sulphur ore was encountered in mining operations during 1942.

4. ESTIMATE OF ORE RESERVES:

a. Developed Ore:

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

	Athens Lots 1,7,10,&12	Mitchell Lots 8, 9, 10	Corbit Lot 13	Total Tons
4th Level and above	530,940	420,297	499,641	1,450,878
4th Level to 6th Level	600,060	791,216	12,167	1,403,443
6th Level to 7th Level	504,495	166,781		671,276
7th Level to 8th Level	525,554	9,588		535,142
8th Level to 9th Level	316,885			316,885
9th Level to 10th Level	423,922			423,922
Below 10th Level	60,784			60,784
Total Gross Tons	2,962,640	1,387,882	511,808	4,862,330
Less 10% Loss in Mng.	296,264	138,788	51,181	486,233
	2,666,376	1,249,094	460,627	4,376,097
Less 10% Loss for Rock	266,638	124,909	46,063	437,610
	2,399,738	1,124,185	414,564	3,938,487
Less Dec. Production	38,965	17,004		55,969
Net Tons 1942	2,360,773	1,107,181	414,564	3,882,518
Net Tons 1941	2,444,843	1,174,314	431,712	4,050,869
Decrease	84,070	67,133	17,148	168,351

There was a decrease of 168,351 tons in the estimated ore reserves as compared with the previous year. Deducting this figure from the product of 681,748 tons in 1942 shows that 513,397 tons of additional ore was developed in 1942. The additional ore developed was divided as follows: 420,201 tons in the Athens Lots and 110,344 tons in the Mitchell Lease Lots. The major portion of this ore was found above the fourth level where exploration and development work has been underway during the year and several new mining areas have

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4. ESTIMATE OF ORE RESERVES: (CONT.)

a. Developed ore: (cont.)

disclosed ore extensions beyond previously assumed limits. A decrease of 17,148 tons in the estimate of reserves in the Corbit Lease was due to a change made in the ore outline on the basis of mining adjacent to this lot. There was also an increase in the estimated reserves between the fourth and sixth levels due to an increase in the ore area on the fourth level beyond limits used in previous estimates.

b. Prospective Ore:

All ore in the mine is developed.

c. Estimated Analysis:

Ore Reserves: Approximate Expected Natural Analysis:

Tons	Iron	Phos.	Sil.	Mang.	Alum	Lime	Mag.	Sul	Loss	Moist.
3,882,518	52.55	.113	6.09	.374	2.75	.62	.73	.010	1.40	13.00

Ore In Stock: Average Natural Analysis:

	Tons	Iron	Phos.	Sil.	Mang.	Alum	Lime	Mag.	Sul	Loss	Moist.
Athens	42,794	51.41	.111	7.41	.365	2.29	.573	.608	.010	1.35	13.18
Mitchell Lease	17,886	52.28	.102	6.98	.366	2.30	.576	.611	.009	1.35	12.75

5. LABOR AND WAGES:

a. Comments:

The average number of employees in 1942 was 419 as compared with 399 in 1941, an increase of twenty men. During the year a total of 120 men were hired to replace men who left for the following reasons: A total of 32 men were drafted or enlisted into the service, 31 quit to seek work elsewhere, 25 were transferred to other mines, 5 were discharged, one was retired and one died. The largest number of employees were lost due to drafting and enlistments into service, however, during the latter part of the year more consideration was being given deferment requests for those employees of draft age who are not considered as skilled workers. Deferment requests were made to the local draft board early in the year only for miners with about two years experience and several other skilled workers, but as the supply of available labor was rapidly being exhausted deferment requests were made for such sem-skilled workers as timber hoisters, motor crews, and skip tenders. Indications are that a more liberal attitude will be taken by the local draft board regarding deferments for the latter group of employees. Those employees who quit to seek work elsewhere also represent a large proportion of the labor turn-over. Most of these have left for the larger cities where they have been attracted by the high wages paid in some defense plants. The third largest group of employees that were lost were those transferred to the Company's Princeton Mine when operations were started at this property during the year. These employees are residents of Gwinn and Princeton who had been transferred to the Athens Mine when the Gardner-Mackinaw Mine was shut down.

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5. LABOR AND WAGES:

a. Comments: (Cont.)

The average earnings per month of each employee was $175.30 in 1942 as compared with $163.11 in 1941, an increase of $12.19. There was no increase in the hourly rate for labor during the year, but due to the sixth day operation at a time and one-half rate for the entire year, there was an increase in each employee's average monthly earnings.

b. Comparative Statement of Wages and Product:

	1942	1941	Increase	Decrease
PRODUCT	681,748	648,750	32,998	
No. Shifts and Hours	1-8 3	1-8 25		22
	2-8 50	2-8 23	27	
	3-8 248	3-8 248		
Average No. Men Working:				
Surface	72	68	4	
Underground	347	331	16	
Total	419	399	20	
Average Wages Per Day:				
Surface	6.72	6.40	32	
Underground	7.71	7.34	37	
Total	7.53	7.17	36	
Average Wages Per Month: (Based on Mine Payroll including Captain & Clerks)				
Surface	160.14	150.39	9.75	
Underground	178.65	165.70	12.95	
Total	175.47	163.09	12.38	
Product Per Man Per Day:				
Surface	33.12	33.84		.72
Underground	7.06	7.23		.17
Total	5.82	5.96		.14
Labor Cost Per Ton:				
Surface	.203	.189	.014	
Underground	1.091	1.015	.076	
Total	1.294	1.204	.090	
Average Product Mining:				
Stoping	21.87	22.46		.59
Development in Ore	10.39	12.06		1.67
Total	21.53	21.97		.44
Average Wages for Labor	8.37	8.28	.09	
Total Number of Days:				
Surface	20,582	19,169	1,413	
Underground	96,537	89,691	6,846	
Total	117,119	108,860	8,259	
Amount for Labor:				
Surface	138,362.70	122,719.02	15,643.68	
Underground	743,879.90	658,167.80	85,712.10	
Total	882,242.60	780,886.82	101,355.78	

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5. LABOR AND WAGES: (CONT.)

Average wages Per Month as Per Labor Statement - Less Captain & Clerks:	1942	1941	Increase	Decrease
Surface	159.75	150.99	8.76	
Underground	178.35	165.46	12.89	
Total	175.30	163.11	12.19	

Proportion of Surface to Underground Men:

1942 - 1 to 4.819

5-3-8 hr. Shifts & 1-2-8 hr. Shift January 1st to Dec. 31st 1942

1941 - 1 to 5.156

5-3-8 hr. Shifts January 1st to January 25th, 1941.
5-3-8 hr. shifts and 1-1-8 hr. shift January 25th to June 1st, 1941.
5-3-8 hr. shifts and 1-2-8 hr. shift June 1st to December 31, 1941.

c. Operating Schedules - 1942:

Month	Days Mine Worked Per Week	Days Per Month	Days Men Worked Per Week	Avg. Shifts Worked Per Month by Each Man
January	6	26	5 & 6	24
Bebruary	6	24	5 & 6	23
March	6	26	5 & 6	24
April	6	26	5 % 6	24
May	6	26	5 & 6	24
June	6	27	5 & 6	25
July	6	20	5 & 6	19
August	6	26	5 & 6	24
September	6	26	5 & 6	24
October	6	26	5 & 6	24
November	6	24	5 & 6	22
December	6	24	5 & 6	22
Total		301		279
Average for year mine operated		25.09		
Average for year worked by each man				23.08

6. SURFACE:

a-1. Buildings:

Some repairs and painting of the interior of the office building was completed early in the year. The plaster in two rooms had become cracked to such an extent that a plasterboard sheeting was placed over the walls and ceilings. A partition wall and ceiling was also constructed for the heating plant room to prevent dust entering the other office rooms. The walls and ceiling in each room and in the hallways, excepting the warehouse storeroom, were painted and the woodwork varnished. The repairs and painting of the interior of the office building has made a big improvement in its appearance and put it in good condition for a number of years.

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6. SURFACE: (CONT.)

a-1. Buildings: (Cont.)

The program of remodeling the dry house was also completed early in the year. The major portion of this work however, was done in 1941. A small shower room with two showers was built in the surface dry extension to provide independent showers for the convenience of the surface men. This improvement was made following a request by representatives of The Marquette Range Industrial Union. The interior painting of the dry house building was completed in May. The upper portion including the roof trusses were painted white and the lower eight feet of the walls a dark red. The remodeling and painting has made a big improvement in the appearance and conditons in the dry. Also by means of two low pressure exhaust ventilating fans installed in the North and South walls of the underground clothes room end of the dry house a large amount of the dust that is created when the men are changing is eliminated.

Some repairs were made to a number of windows on the engine house replacing rotted parts of window sash and also the frames. Heavy one quarter inch mesh screens were also made for the windows that are opened during the hot Summer weather and are installed so they can not be removed. These screens were placed as a precautionary measure against sabotage, permitting entrance to the engine house only through the main door which is kept locked at all times and employees must use a key when entering.

Another precautionary measure against sabotage for the duration of the war was the installation of flood lights around such surface buildings as the engine house, shaft house, and shops. A total of six five hundred watt flood lights and a number of lights of less illumination have been installed at and about the above buildings to light up the area surrounding them.

A concrete tank was constructed for collecting the dry house discharge water a short distance South of the dry house. The water from the showers and that used for washing the floors formerly discharged into a ditch to the South of the dry house which connected to Partridge Creek. The ditch crossed the large area of surface settlement and water flowing through the ditch was interrupted by a break in surface permitting it to flow into the mine workings. The discharge from the dry house is now piped to the tank from which it is pumped by an automatically operated electric pump through six hundred feet of two inch pipe line that is connected with the mine discharge line at the shaft.

A frame building was constructed over the concrete tank to house the pumping equipment and protect it from the weather.

a-2 Docks Trestles and Pockets:

There was no wood trestle extension to the steel trestle erected during the year. The extension on the Southeast steel trestle has been left intact since all the ore was loaded out from this trestle in 1941 and no ore was stocked from it in 1942. Some minor repairs were made to the East steel trestle where several pieces of rotted decking were replaced. On the approach of this trestle some new two inch fir plank was laid over the decking to prevent the spillage from the tram cars falling down on the railroad tracks and also on

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6. SURFACE: (CONT.)

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

a roadway that passes underneath.

The district tractor bulldozer unit was employed intermittantly during the year leveling the top of the rock pile to provide additional storage capacity for hoisted rock. By this means it has been possible to eliminate the erection of additional rock trestle during 1942. However, it has been necessary to make repairs to a number of bents on the rock trestle and early in 1943 an additional bent or two will be erected.

On several occasions repairs were made in the skip dump renewing worn out plates and also reenforcing some steel members. Worn out plates were also replaced in the storage pockets and some repairs made to the platform and guard railing at the chutes.

b. Stockpiles:

The early opening of navigation on the lakes made it possible to start shipping from the stockpile on March 21st. Late in November shipping from the stockpile was concluded as all the ore, both Athens and Mitchell Lease grades, was loaded out from the stockpile. Some wet ore of both grades that had been dumped on the pile during the shipping season was also loaded out at the end of the season. When cleaning up the remaining strip of ore under both trestles the bulldozer was employed in conjuction with the shovel operations cleaning up the scattered ore, and with the aid of this unit faster loading was possible and a better clean-up made. In spite of the heavy operating schedule that was maintained during the year the capacity of both steel trestles was sufficient to provide stocking room for the ore without using the wood trestle extension.

C. Timber Treating Plant:

The timber treating plant which was moved to the Maas Mine in 1941 has been sold to that mine and is now operated by the Maas Mine. The treated timber used at the Athens mine is now purchased from the Maas Mine.

d. District Portable Saw Mill:

Early in the year a portable No. 1 Standard Belt Feed Saw Mill was purchased from the American Saw Mill Machinery Company and installed at the West end of the Athens Mine timber yard. The purpose of the mill was to saw selected mine timber, both hardwood and softwood, into boards, plank and other dimension timber, and ties. This timber was for use at the Athens Mine and was also sold to the other mines and General Storehouse for construction work and other uses. The slabs that were obtained were used underground for covering down the floor of slices in addition to the poles that are used for this purpose. After the mill had been operated for about three months it became apparant that more room would be required for storage of the sawed lumber and slabs so the mill was moved and permanantly installed at the Negaunee Mine where ample room was available by grading some grounds adjacent to the rock pile.

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6. SURFACE: (CONT.)

d. District Portable Saw Mill: (Cont.)

The following is a summary of the lumber and dimension timber sawed by the mill:

Month	Board Feet	Lineal Feet	Size	Material
May	32,413		1" - 3"	Maple, Oak, Tam. & Hemlock
June	9,051		1" - 3"	Maple, Oak, Tam. & Hemlock
July	5,297		1" - 2"	Maple and Hemlock
		2,955	6" ties	Tamarack
		180	8" sills	Tamarack
		68	8" uprights	Tamarack
August	18,948		1" - 4"	Maple, Oak and Hemlock
		171	5" ties	Tamarack
		270	8" sills	Tamarack
		450	8" uprights	Tamarack
Total	65,709	4,094		

In addition to the above material several hundred pieces of nine foot cull timber mainly tamarack was sorted out of the skidways and sawed into slabs of two inch thickness for use as floor covering underground.

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

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

	1942		1941		1940	
	Gallons	Amount	Gallons	Amount	Gallons	Amount
1st Quarter	3,118,000	207.94	2,364,000	179.44	3,116,000	228.99
2nd Quarter	3,195,000	233.92	2,450,000	182.23	1,246,000	98.07
3rd Quarter	3,111,000	229.07	2,477,000	184.50	2,376,000	177.08
4th Quarter	3,083,000	226.40	2,621,000	197.78	2,414,000	179.44
Total	12,507,000	897.33	9,912,000	743.95	9,152,000	683.58
Product-Tons	681,748		648,750		515,725	
Cost per Ton	.001316		.001147		.001325	

There was an increase in the amount of water purchased from the City as compared with the previous year. There was a slight increase also in the cost per ton for water in spite of the larger product in 1942 due in part to more operating shifts in 1942. Another reason for the increased amount of water used is due to the installation of an automatically operated centrifugal booster pump that has been connected with the four inch water main leading into the mine. The pump was installed in a concrete lined pit that was excavated and constructed above the main water line in the mine yard. The purpose of the pump is to maintain an adequate water supply and eliminate the drop in pressure that occurred during the change of shifts when the men were using the showers. Better water pressure is now maintained and consequently more water supplied to the showers and the several complaints registered by the men due to this factor have been eliminated.

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6. SURFACE: (CONT.)

f. Grounds:

The shrubbery, lawn and trees around the mine buildings were maintained in good condition during the summer months. The usual work of trimming the shrubbery and trees, and watering and mowing the lawns, was performed during the summer season.

A new road was graded for trucking timber into the mine timber yard, it is located along the South side of the hill on which the engine house is situated and parallel to the pocket tracks. By means of the new road trucks delivering timber to the mine can unload into the skidways at a higher elevation permitting easier unloading and more storage capacity than when unloading directly in the timber yard.

The roadway on the hill to the engine house has been closed off by means of a locked gate and erection of short sections of fence on each side. The purpose of closing off the road was to prevent unauthorized persons from traveling by car or any other means directly to the engine house and is another precautionary measure to guard against sabotage to the surface equipment and plants. With the increased and more efficient police protection on surface and floodlighting of vital surface buildings and other protective measures possibilities of acts of sabotage have been lessened. Also walking about or taking short cuts through the mine property by any person has been stopped. All traffic including most of the employees entering and leaving who possess identification cards is through the main gate on Ann Street.

7. UNDERGROUND:

a. Shaft Sinking:

There was no shaft sinking in 1940.

b. Development:

The major portion of the development program in 1942 was confined to the fourth level and consisted mainly of putting up additional raises as development of mining greas under the hanging disclosed new ore extensions and the ore outline. Work above this level has been concentrated in areas adjacent to the North and South footwall where the ore has been found to extend to the highest elevations. To develop the latter area for mining it was necessary, early in the year, to extend the most Easterly cross-cut further to the Southfrom which two additional raises were put up and mining started at a height of 150 feet above the level in Athens Lot twelve. Late in the year development and exploration was started from a newly completed raise in Athens Lot twelve at a height of 225 feet above the level in the ore body adjacent to the North footwall. Development of the above two areas which are relatively widely separated by a syncline in the jasper hanging has necessatated driving a large amount of connecting drift at an intermediate elevations for ventilation. Some of these connections are all in ore while others have been driven partly through jasper hanging.

On the seventh level a new cross-cut was driven South of the fault dike and one raise put up into the Block four area adjacent tothe South footwall. This cross-cut is relatively short as it is planned to mine this small ore area by means of one raise.

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7. UNDERGROUND: (CONT.)

b. Development: (Cont.)

A development program was started on the eight level during the year where a new cross-cut was being driven in rock to the Southeast from the main haulage drift. Work in driving the cross-cut was being rushed late in the year so that raises can be put up into the Block three area North of the fault dike where the mining is approaching the seventh level elevation. Two raises will be put up into the above area to provide additional working places as soon as the cross-cut has advanced further to the Southeast.

On the tenth level the by-pass rock drift that parallels the main haulage way and into which the new fan was installed was completed early in the year. Air lock doors have been installed in the main haulage drift so no interference to the ventilation in the mine will result due to the operation of motor trains when the tenth level is reopened for mining in 1943.

b-1. Development in Ore:

The following is a detailed description of the development in ore in 1942:

4th Level:

The development in ore on this level was confined entirely to raising.

No. 401 raise, located in the East-West ore drift, was advanced 161 feet in ore to the jasper hanging. Some mining had indicated an ore area above this elevation so the raise was extended through jasper, which apparently was a roll in the hanging, to a higher elevation when ore was again encountered. The raise was completed to a height of 196 feet above the level. The raising in rock is described under "Rock Development".

No. 403 raise is located along the West side of the West cross-cut about 20 feet south of No. 402 raise. The raise was advanced 92 feet in ore to completion at a height of 102 feet above the level to the Jasper hanging.

No. 405 raise is located in the East-West ore drift about fifty feet West of No. 401 raise and was advanced 106 feet in ore to the jasper hanging. The raise was extended into the jasper hanging to determine whether this jasper was the true hanging or a roll in the hanging with ore at a higher elevation. Late in December the raise was completed at a height of 183 feet above the level. The raising in rock is described under rock development.

No. 415 raise is located in the most Easterly cross-cut along the East side and was advanced 184 feet in ore to the jasper hanging. The raise was advanced through footwall slate and dike to a height of 81 feet before ore was encountered and also about ten feet of dike was penetrated after reaching the ore at a height of 245 feet above the level. After reaching the jasper hanging an advance of ten feet was made in the jasper to complete the raise at a height of 275 feet above the level.

No. 417 raise is located in the most Easterly cross-cut along the East side and was advanced 175 feet in ore to the jasper hanging. About ten feet of advance was made into the jasper hanging to complete the raise at a height of 195 feet above the level.

No. 419 raise is located in the most Easterly cross-cut along the East side and was advanced 180 feet in ore to complete it to the jasper hanging at a height of 190 feet above the level. This raise was in ore for its entire length.

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7. UNDERGROUND: (CONT.)

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

No. 421 raise is located in the most Easterly cross-cut along the East side and was advanced 93 feet in ore to the jasper hanging where it was completed at a height of 181 feet above the level. The raise was advanced through 50 feet of footwall slate before encountering the ore and about 28 feet of dike after reaching the ore. The latter is also described under rock development.

No. 423 raise is located in the most Easterly cross-cut along the East side and was advanced 144 feet in ore to complete it to the jasper hanging at a height of 169 feet above the level. This raise was also advanced through footwall slate before encountereing the ore at a height of 25 feet above the level. The rock raising is described under "Rock Development".

7th Level:

The new cross-cut South of the fault dike was advanced 65 feet in ore around the turn to the Southeast before encountering the slate footwall. The cross-cut was advanced in the footwall material further to the Southeast and one raise put up into the ore area in Block four that is being mined adjacent to the South footwall.

No. 703 raise in No. 700 cross-cut as described above, was advanced 13 feet in ore to a height of 168 feet above the level. The raise was advanced through 145 feet of footwall jasper and slate before the ore was encountered. Due to the fact that such a small amount of ore was encountered in this raise it was decided to mine the remainder of the small ore pillar in the South footwall portion of Block four by means of only one raise when mining from the sixth level raise is abandoned.

No. 714 raise in No. 710 cross-cut was advanced 158 feet in ore to a height of 168 feet above the level. This raise was put up into the small Block four ore area North of the fault dike and the raise was in ore for its entire length.

No. 814 branch raise is an extension of old No. 814 raise which is used as a ventilation connection between the eight and seventh levels. The direction of the extension above the seventh level is to the Southeast and the raise was advanced 60 feet in ore to a height of 80 feet above the level to complete it at this height.

8th Level:

No. 816 raise in No. 810 cross-cut was advanced 94 feet in ore to complete the raise at a height of 161 feet above the level. This raise was advanced through footwall slate for a distance of 57 before encountered the ore.

-855' Sub:

Ventilation raise from the -855' sub to the eight level was advanced 55 feet in ore to complete the connection. This raise was put up from the end of a drift that was advanced to the East from No. 902 raise beyond the limit of Block two.

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7. UNDERGROUND: (CONT.)

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

9th Level:

No. 903 raise located along the South side in the main ore drift about 50 feet Southwest of No. 902 raise was advanced 82 feet in ore to complete it at a height of 92 feet above the level.

No. 905 raise located along the South side in the main ore drift about 60 feet Southwest of No. 904 raise was advanced 83 feet in ore to complete it at a height of 93 feet above the level.

The following is a summary of the development footage in ore in 1942:

	Drifting	Raising	Total
4th Level		1135'	1135'
7th Level	65'	241'	306'
8th Level		94'	94'
-855' Sub		55'	55'
9th Level		165'	165'
Total 1942	65'	1690'	1755'
Total 1941	928'	1410'	2338'
Increase		280'	
Decrease	863'		583'

b-2. Development in Rock:

-170' Sub above 4th Level:

During December exploration and development of an ore area was underway in the area along the North footwall side and 21 feet of drift was advanced through dike to the Northwest from No. 915 raise.

-230' Sub Above 4th Level:

During the progress of mining a contract advanced a slice through 28 feet of jasper hanging to enable recovery of all the ore in the area adjacent to the North footwall.

-245' Sub Above 4th Level:

While developing a mining area near the South footwall 40 feet of test drift was advanced in jasper to the Southeast from No. 421 raise.

-260' Sub Above 4th Level:

A ventilation connection between No. 416 and No. 417 raises was advanced through 20 feet of jasper hanging. The remainder of the connecting drift was in ore.

-315' Sub Above 4th Level:

A ventilation connection between No. 403 and No. 401 raises was advanced through 57 feet of jasper hanging. Only a small amount of this drift was in ore.

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7. UNDERGROUND: (CONT.)

b-2. Development in Rock:

4th Level:

The extension of the most Easterly cross-cut to the South in the footwall material was completed early in the year. The advance was 73 feet in lean ore, slate and dike. Two additional raises were put up from the extension of the cross-cut into the ore area near the South footwall.

No. 401 raise in the East-West ore drift was advanced 25 feet in jasper near the top portion of the raise and ore was again encountered at a height of 196 feet above the level.

No. 405 raise in East-West ore drift was advanced 67 feet in jasper hanging to complete it at a height of 183 feet above the level. The raise was extended into the jasper to determine whether the true hanging was encountered or a roll in the hanging with ore at a higher elevation.

No. 415 raise in the East cross-cut was advanced 71 feet in footwall slate before encountering the ore and about 10 feet of dike after entering the ore. When the raise reached the hanging 10feet of additional raise was advanced in jasper to complete it at a height of 275 feet above the level.

No. 417 raise in the East cross-cut was advanced 10 feet in jasper to completion at a height of 195 feet above the level. This raise was entirely in ore with the exception of the 10 feet of raise that was advanced into jasper hanging.

No. 416 raise in the East cross-cut was put up in 1941 to the -260' sub level elevation and extended in 1942 a distance of 30 feet in jasper to completed it to the -220' sub.

No. 421 raise in the East cross-cut was advanced 28 feet in lean ore and slate before encountering the ore. The raise was advanced in ore to a height of 181 feet above the level where the jasper hanging was encountered.

No. 423 raise in the East cross-cut was advanced 15 feet in lean ore and slate before the ore was encountered and then advanced to a height of 169 feet above the level to complete it to the jasper hanging.

6th Level:

To provide another ventilation connection between the seventh and sixth levels 35 feet of drift was advanced in footwall slate from the sixth level cross-cut a short distance Northwest from No. 614 raise West to No. 703 raise.

-645' Sub:

A total of 126 feet of drift was advanced Northeast and Southwest from No. 726 raise in footwall slate and lean ore to replace a portion of the ventilation connection on the -615' sub that had crushed. A single compartment raise was put up 25 feet in slate to hole to the open portion of the old connection on the -615' sub to provide a ventilation connection between the seventh and sixth levels.

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7. UNDERGROUND: (CONT.)

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

7th Level:

The new cross-cut South of the fault dike was advanced 126 feet in footwall slate and lean ore after passing out of the ore. Upon completion of the cross-cut one raise was cut out and put up into the ore area in Block 4 near the South footwall.

No. 703 raise in the new cross-cut South of the dike was advanced 145' in footwall slate, jasper, and lean ore before encountering the ore a short distance above the sixth level elevation.

8th Level:

The old No. 810 cross-cut was extended 85 feet further to the Southeast in footwall slate. The extension of this cross-cut was necessary to provide for a raise that will be put up later for mining a portion of the footwall area in Block three South of the dikes as mining approaches the seventh level elevation.

Development of a new cross-cut to the Southeast from the main haulage drift was started late in the year and was advanced 158 feet by the end of the year in diorite formation. This cross-cut will be extended to the Southeast to provide for raises that will be put up into the Block three area North of the fault dike. The West half of this block was being mined from eight level raises late in the year and raises from the new cross-cut will be used to mine the remainder of the Block three area and also later the Block four area North of the dike. Early in January 1943 ore was encountered when the cross-cut had crossed the large diorite dike and a small amount of slate. Work here is being rushed so the raises can be put up and additional working places provided as soon as possible.

No. 816 raise in No. 81 cross-cut was advanced 57 feet in footwall slate and jasper before encountering the ore. The remainder of the raise was in ore to a height of 161 feet above the level at which height mining was started from the raise upon its completion into the Block three area North of the Dike.

-830' Sub:

To recover a lost diamond drill bit in a hole drilled from surface a number of years ago about 85 feet of drift was advanced in diorite formation from the end of a slice Northwest from No. 906 raise. The approximate location of the lost bit was known from the surveys made when the hole was drilled and when drifting toward this point from the end of the slice several lengths of disconnected drill rods were discovered and which were followed until the bit was found. The appraised value of the diamond chips in the recovered bit was only $93.87.

-840' Sub:

While driving a connecting drift between No. 930 and No. 932 raises slate was encountered and the drift was advanced through 17 feet of this material. This drift which was directly adjacent to the footwall served as a means of intercepting a large amount of water flowing along the footwall contact and drained it away from the mining area in Block two.

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7. UNDERGROUND: (CONT.)

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

-855' Sub:

A connecting drift was also driven in December at this elevation between No. 930 and No. 932 raises in footwall slate to intercept water that is concentrated along the South footwall in the Block two area. There was 42 feet of rock drift advanced to completed the connection. By means of drainage drifts adjacent to the footwall in this area it has been possible to drain a large amount of water away before it enters the mining area and conditions have been materially improved.

10th Level:

The by-pass drift parallel to themain haulage drift was completed early in the year and the new mine ventilation fan installed in it. There was a total of 182 feet of drifting in diorite formation and slate done in 1942 to complete the work. Installation of the new 80,000 cubic feet per minute fan and construction of air lock doors and a concrete seal at the fan station was completed in June and the new unit put into operation. Ventilation in the mine was greatly improved by the new and larger fan.

Skip Pit - Bottom of Shaft:

During 1941 work was started to enlarge and modernize the skip pit layout to facilitate the work of cleaning the accumulated spillage of ore. In 1942 about 27 feet of additional rock drifting was done to provide room for the tracks, switch, and scraper slide. A concrete pillar was constructed under the skip pit chute to provide strong support and eliminate the numerous repairs that were required at this chute when timber construction was used. A 15 H. P. electric scraper hoist is used to load a two ton rocker dump car. The loaded skip pit car is now dumped on the loth level whereas formerly the loaded buggy was hoisted to the sixth level and dumped. The work in cleaning the skip pit has been speeded up considerably by enlarging it, in fact one clean-up shift has been eliminated entirely as the work can now be completed in one eight hour shift in a 24 hour period as compared with two eight hour shifts in the same period formerly.

There was a large increase in the development footage in rock in 1942 as compared with 1941. This was largely due to the heavy raising program maintained throughout the year and most of the raises that were put up advanced through footwall material for some distance above the levels before encountering the ore. Also above the fourth level most of the raises were advanced into the jasper hanging for some distance for exploration purposes to determine whether the true hanging had been reached or seams of jasper in the ore encountered.

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7. UNDERGROUND: (CONT.)

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

The following is a summary of the development footage in rock in 1942:

	Drifting	Raising	Total
-170' Sub.	21'		21'
-230' Sub	28'		28'
-245' Sub	40'		40'
-260' Sub	20'		20'
-315' Sub	57'		57'
4th Level	73'	316'	389'
6th Level	35'		35'
-645' Sub	126'	25'	151'
7th Level	182'	145'	327'
8th Level	243'	57'	300'
-830' Sub	85'		85'
-840' Sub	17'		17'
-855' Sub	42'		42'
10th Level	182'		182'
Skip Pit	27'		27'
Total 1942	1178'	543'	1721'
Total 1941	922'	53'	975'
Increase	256'	490'	746'

c. Stoping:

(1) General:

The product in 1942 was obtained from the same mining blocks as in the previous years viz., Blocks two, three, four and five. The latter block is being developed for mining above the fourth level and the product from this area is increasing as more mining places are being developed. The ore areas in the other blocks, with one exception are gradually decreasing in size as mining progresses to lower elevations. This has made it necessary to reduce the number of contracts in some of the areas during the year to eliminate crowding which prevents maximum production by each contract. The new areas being developed under the hanging above the fourth level provides places for transfer of those contracts from areas at lower elevation that are decreasing in size or being exhausted.

The distribution of the 1942 product into the various blocks from which it was obtained shows about twenty percent from Block two which is being mined above the ninth level on a total of four subs, the -800', -815',-830' and -840' subs, respectively. There was a small decrease in the tonnage mined in this block in 1942 as compared with the previous year. Some improvement has been made in mining conditions here during the year in the wet areas in this block along the footwallside, by driving drainage drifts in rock along the footwall to intercept the water before it enters the ore area.

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7. UNDERGROUND: (CONT.)

c. Stoping: (Cont.)

(1) General: (Cont.)

In the Block three area about 37 percent of the 1942 product was mined in the area North and South of the fault dike on a total of six sub levels viz., -600', -615', -625', -635', -645' and the -660' subs. The greater portion of the ore mined during the year was obtained from this block which is the largest in area enabling more mining places to be worked. In several mining places along the South footwall in the area South of the fault dike water that is concentrated along the slate footwall has hindered operations considerably. However, by laying pipe in the floor of the completed slices, it has been possible to drain away a large amount and improve conditions in adjacent workings.

The Block four area North and South of the dikes is the smallest in area of the developed blocks and about 24 percentof the product was mined in this block on a total of seven sub-levels, viz., -515', -530', -540', -550', -565', -575' and the sixth level elevation. This block is being mined on areas at three different elevation, two of which are South and the other North of the fault dike. The area along the South footwall is rapidly becoming smaller in size as mining progresses, to lower elevations due to the encroachment of the footwall. In area North of the dike, water entering the area along the footwall hinders operations considerably.

Production from the areas being developed above the fourth level has increased from about nine percent of the total product in 1941 to about nineteen percent in 1942. Mining was done on a total of eleven sub-levels above the fourth level during the year, viz., -170' -220', -235', -245', -260' -275', -300', -315', -315', -330', -340', and -355' subs. The extent of the ore area mined in several of the sub levels were relatively small which accounts for the large number of sub levels on which mining was done as compared with the other blocks.

(2) Detail of Stoping:

The following is a detailed description of mining in the various blocks beginning with the highest area in Block 5 above the fourth level:

South of Fault Dike-Block 5, Above the 4th Level:

During December development of a new mining area was underway, near the North footwall on the -170' sub, 225 feet above the fourth level. An exploration drift to the Northwest from No. 415 raise advanced a short distance in ore and then encountered a dike about twenty feet in thickness through which the drift was advanced. Lean ore and jasper was encountered directly on the other side of the dike but upon advancing a short distance further ore was again encountered. Exploration will be continued in the area between the dike and slate footwall to determine the extent of the ore body at this elevation and also to provide information for putting up another raise that can be

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7. UNDERGROUND: (CONT.)

c. Stoping: (Cont.)

(2) Detail of Stoping: (Cont.)

more advantageously located for mining this area. The ore body apparently occurs here as a riseralong the South side of the Eastwest dike and also in the narrow area between the dike and the North footwall. It is likely that only a small area will be developed at this elevation directly under the jasper hanging.

A short distance to the Southwest a relatively large ore area has been developed for mining along the North footwall. Development of this area was started under the hanging in 1941, on the -220' sub level by one contract but as the area grew larger two contracts were added upon completion of new raises from the fourth level. Mining on the -220' sub level was completed in 1942 and late in December recovery of the remaining pillars in the -230' sub level was underway. On completion of mining the first sub under the hanging, long holes were drilled into the jasper hanging above the slices and blasted to form a cushion of filling above susequent subs. A good covering of close poles and slabs and wire netting was also laid down in the floor of completed slices to begin the formation of a timber mate above the mining area. A short distance beyond the mining limit that has been established as the East boundary of the area a connecting drift was driven on the -230' sub between No. 415 and No. 417 raise for ventilation and traveling purposes into the area being developed the -170' sub.

Development of the ore area along the South footwall side of the ore body in Athens Lot twelve followed upon completion of the extension of the East cross-cut on the fourth level early in the year. Two raises were put up in this area. Mining was started under the hanging on the -245' sub, first by one contract and latter by two contracts when the second raise was completed into the area. The ore area on the first sub-level was quite small, about one hundred feet by one hundred feet in size, the cave above some old mining on the -275' sub was encountered along the west side, and jasper on the North and South sides. Along the East side a mining limit was established near the Corbit Lease boundary as the ore extended higher due to the rise of the jasper hanging in this direction. The ore body in the Corbit Lease will be developed for mining later from another cross-cut on the fourth level. A second sub-level, the -260' was also mined along the South footwall and mining on the-275' sub was underway late in the year.

In 1941 development of three mining areas in Athens Lot ten and Mitchell Lease Lot eleven was started under the hanging from raises in the West cross-cut on the -290', -300' and -330' sub levels respectively. Mining on the -300' sub by one contract Northwest from No. 402 raise was abandoned early in the year when exploration from raises in the East cross-cut disclosed ore at a higher elevation directly above this area. In the other small area directly south mining was completed in the -315' and -330' subs, and then mining was temporarily abandoned here as new areas at higher elevations were developed during the year. In the third area developed here from No. 408 raise in the West cross-cut mining was continued by one contract on the -340' and -355' subs during the year. This area has increased in size materially as mining has progressed to lower elevations, but it will be possible to mine only two more subs above the fourth level after which raises from the sixth level will be required to continue mining in this area.

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7. UNDERGROUND: (CONT.)

c. Stoping: (Cont.)

(2) Detail of Stoping: (Cont.)

South Side of Fault Dike - Block 4 - Above the 6th Level:
Ore Area Adjacent ot the south Footwall:

Early in the year mining was underway on the -515' sub by three contracts working from three sixth level raises above No. 610 cross-cut. When mining on the -515' sub level was completed one contract was removed from the area and transfered to a new area above the fourth level, leaving two contracts to mine here during the balance of the year. The encroachment of the jasper and slate footwall from the South and East has decreased the size of this ore area as mining progressed to lower elevations with the result that a reduction in the number of contracts was made necessary. Mining on the -530' sub was also completed during the year and development of the -540' sub was well underway late in December. Upon completion of the new cross-cut South of the fault dike on the seventh level, one raise was put up into this area and it was used for a small amount of mining on the -530' sub in addition to the sixth level raises. Mining has now reached an elevation about fifty feet above the sixth level and the area being relatively small about one hundred fifty feet by one hundred feet, it will be mined by means of the one raise from the seventh level when mining from the last sixth level raise is abandoned.

South Side of Fault Dike - Block 4 - Above the 6th Level:
Ore Area Directly South of the Fault Dike:

Two contracts have continued mining in this area from two seventh level raises, and during the year mining was completed on the -565' sub and also the -575' sub and in December mining was underway at the sixth level elevation. On subs above the -575' sub level an area about one hundred seventy feet by one hundred sixty feet comprised the ore area, but upon reaching the latter elevation footwall slate was encountered along the South side in which direction mining on subs above extended to a mining limit. The advance of the footwall from the South and East together with the dip of the fault dike to the Southeast has resulted in a reduction in the size of this area, and it will continue to get smaller as mining progresses to lower elevations. On the sixth level elevation a ventilation connection was driven Northeast from No. 701 raise beyond the mining limit of Block four to connect with the sixth level drift near no. 609 switch. Some water that originates from a surface Diamond Drill hole directly above this area is encountered when mining adjacent to the block limit along the Northeast side and operations are hindered materially when mining in this direction.

North Side of Fault Dike - Block 4 - Above the 6th Level:

This area was mined on four sub levels during the year by two contracts. Early in the year some mining on the -540' sub was done from one sixth level raise and the remainder from the seventh level raise, but due to the large amount of repair work required to maintain this haulage drift on the sixth level on account of the heavy pressure mining from the sixth level raise was abandoned on the lower subs. Another

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7. UNDERGROUND: (CONT.)

c. Stoping: (Cont.)

(2) Detail of Stoping: (Cont.)

North Side of Fault Dike - Block 4- Above the 6th Level: (Cont.)

raise from the seventh level was put up to replace the sixth level raise to enable two contracts to continue mining on the -550' and -565' subs and late in December recovery of two remaining pillars was underway on the -575' sub. When mining adjacent to the slate footwall operations are hindered by the large amount of water that enters the ore area along the footwall contact. However, by driving the first drift on each sub level along the footwall to intercept the water and drain it to the raise through pipes it has been possible to control the greater part of the water and prevent it from entering the adjacent workings. It is planned to concentrate mining in this small triangular ore area by two contracts until the -645' sub level elevation is reached which corresponds to the elevation where mining has been temporarily abandoned in an adjacent area in Block three, about forty feet above the seventh level. Below the -645' sub level the areas will be combined and mined as a unit to lower elevations.

South Side of Fault Dike - Block 3 - Above the 7th Level:

This large area was mined on four sub levels during the year, seven contracts were working here during the early part of the year and later the number was reduced to six due to a decrease in the size of the ore area. The last few pillars were mined on the -600' sub during the first two months of the year and the -615' sub was completly mined. When the latter sub was partially mined one contract mining along the footwall side was removed and transfered to another area, due to the large reduction in the size of the ore area along this side as compared with the sub above. About the middle of the year the -625' sub was developed for mining from raises along the Southeast side of No. 720 cross-cut and late in the year mining from this series of raises was completed at this elevation and developed of the -635' sub was started in December. The west half of this block is mined from raises above No. 730 cross-cut and late in December four contracts were mining on the -625' sub in this portion of the block. Mining in the latter part of the block has been hindered by the large amount of water encountered near the South footwall and also in the area adjacent to the limit between Blocks two and three. One contract confined its work entirely during the past several months to driving a drift parallel to the block limit in an attempt to intercept some of the waterand drain it away from the adjacent workings. Some water was encountered when drifting to the Southeast and shortly afterwards the amount of water entering one of the adjacent areas was reduced and conditions for mining on the sub level above improved materially. Late in the year another contract was removed from the East half of the area that is being mined from raises above No. 720 cross-cut as mining on the -635' sub indicated a further decrease in size, due to advance of the footwall. New areas developed above the fourth level have provided places for those contracts which have had to be removed from the areas that are decreasing in size as mining progresses to lower elevations.

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7. UNDERGROUND: (CONT.)

c. Stoping: (Cont.)

(2) Detail of Stoping; (Cont.)

North Side of Fault Dike - Block 3 - Above the 7th Level:

The area North of the Dike has been mined in two separate units, roughly dividing the area into two equal parts. One contract was mining in the East portion and upon completion of mining on the -645' sub the contract was trasfered to an area above the fourth level and mining was abandoned here temporarily at an elevation about forty feet above the seventh level. When mining in the adjoining area to the East in Block four, reaches a correspomding elevation these two areas will be combined and mined from raises that will be put up from the eight level. Mining in the west half of Block three was carried on by two contracts on three sub levels. Two small pillars were mined on the -630' sub early in the year and mining on the -645' sub was completed with the exception of a small pillar that was being recovered by one of the contracts late in December. The other contract had developed the -660' sub for mining late in the year and was slicing to the Northeast of No. 812 raise in December. A raise that was put up into this area from the eight level in 1942 was used by one contract for mining a portion of the area on the -645' sub and one of the original seventh level raises above No. 740 cross-cut was also used. Upon completion of mining on the -645' sub from the seventh level raise tramming from this area on the seventh level was abandoned due to heavy crushing of the cross-cut caused by the approach of mining operations to within forty feet of the level.

Late in the year another raise was being cut out on the eight level and wil be put up into this area to enable another contract to work here. This area is gradually increasing in size due to the dip to the Northwest of the diorite dike which defines the limits of the ore body on the Northwest side.

Ore Area North of Fault Dike - Block 2 - Above the 9th Level:

Early in the year six contracts were mining in this area on the -815' sub which was partially mined in 1941 and upon completion of mining on this sub and also the major portion of the -830' sub level the number of contracts was reduced to five due to a decrease in the size of the area on the South footwall side. During December two contracts were mining a remaining pillar adjacent to the dike on the -830' sub and two contracts were mining the footwall side of this area on the -830' sub which was developed for mining in October. The fifth contract was employed for several months during the latter part of the year driving drifts for drainage purposes along the south footwall to intercept water that enters the ore area from this direction and drain it away from the adjacent workings. A drift for drainage purposes was driven on the -840' sub following along the ore and footwall contact and also in December a shorter drift was advanced in rock directly under a portion of the drift directly above on the -855' sub. On the latter sub a drift for a ventilation connection was advanced East of No. 902 raise into the Block three area and a raise to the eighth level put up from the end of this drift. Due to the flat pitch of the South footwall to the Northwest the ore area in Block two is decreasing in size rapidly as mining progresses to lower elevations. Mining in this block

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7. UNDERGROUND: (CONT.)

c. Stoping: (Cont.)

(2) Detail of Stoping: (Cont.)

Ore area North of Fault Dike - Block 2 - Above the 9th Level: (Cont.)

has reached an elevation about fifty feet above the ninth level and due to the rapid rate of mining on the present heavy operating schedule and the fact that the ore area is decreasing in size it will be necessary to reopen the tenth level in 1943 and put up raises into the Block two area so mining can be continued in this block when it becomes necessary to abandon work from the ninth level raises. On the tenth level a large portion of the existing haulage drift will be used in addition to which a new cross-cut must be driven from which several raises will be put up to the sub levels now being mined a short distance above the ninth level.

d. Timbering:

The total cost for timbering, labor and supplies, increased $22,027.76 in 1942 as compared with an increase of $106,071.54 in 1941. In the cost per ton the increase was $.008. The increase in cost for timber, lagging and poles was .0168 per ton of ore. The cost per foot for timber increased .0037 and was the highest for many years. This was also true of the cost for seven foot lagging and nine and one half foot poles which increased .2049 per hundred feet. The cost for cribbing timber used in 1942 increased $2,755.14 due to there having been 2,319 feet of raising in 1942, as compared with 952 feet in 1941. As forcast in the 1941 Annual Report the cost for repairing drifts was lower in 1942 due to abandoning haulage drifts under heavy pressure on the sixth level, and transfer of haulage to the seventh level of nearly all the contracts working above the sixth level. The total cost "Timbering" was $.525 per ton and "Stoping" $.481 per ton. The fact that "Timbering" cost was .044 per ton higher than the "Stoping" cost gives a clear picture of the effect of crushing in this mine. Larger timber is used at the Athens than in any of the soft ore mines on the Marquette Range. There were more shifts worked in 1942, also an increase in product and more overtime shifts due to operating seventeen shifts per week for the entire year.

Brief comment is made herewith regarding the areas where most of the repair work was necessary in 1942.

On the fourth level the old main haulage drift turning to the West from the cross-cut to the shaft was retimbered a distance of several hundred feet. It had previously been timbered with eight foot legs and caps; it was enlarged and nine foot timber installed. This drift, in addition to being the main exhaust air way, is also used for tramming ore from two new raises above the fourth level.

Repair work on the sixth level was mainly confined to propping and building bulk heads to keep drifts open for air ways. In 1941 the drifts and cross-cuts here were under constant repairs to keep them open for haulage but with the completion of raises from the seventh level to the sub levels above the sixth level haulage on the sixth level was abandoned early in 1942.

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7. UNDERGROUND: (CONT.)

d. Timbering: (Cont.)

Two cross-cuts and a section of the main drift in ore on the seventh level have required considerable repairs during the year as was also the case in 1941. Some repairs and replacement of rotted timber sets were necessary on the eight and ninth levels but they were not above normal during 1942.

Considerable repairs were necessary to the long raises during the year due to rotting and wear on the cribbing timber. Production from the contracts stops while repairs are underway. The hardwood plank used to line the chute compartments of the raises wear out after a few months service and have to be replaced. The raise is also idle several days while this work is underway.

Statement of Timber Used:

	Lineal Feet	Avg. Price Per Foot	Amount 1942	Amount 1941
6" to 8" Cribbing	170,082	.0412	7,008.59	4,253.45
8" to 10" Stulls	3,125	.0684	213.67	1,706.66
10" to 12" "	192,724	.1011	19,478.88	14,188.38
12" to 14" "	63,441	.1408	8,932.22	10,168.00
14" to 16" "	12,535	.1742	2,183.57	1,899.43
Treated Timber	3,795	.3593	1,363.46	146.24
Total 1942	445,702	.0879	39,180.39	
Total 1941	383,899	.0842		32,362.16
Lagging - 7'	1,822,770	.9082 C	16,554.62	13,022.60
Poles - 9½'	1,560,280	1.6908 C	26,381.30	21,928.31
Total 1942	3,383,050	1,2691 C	42,935.92	
Total 1941	3,284,182	1.0642 C		34,950.91
Wire Netting	4,620		294.34	276.86

	1942	1941
Product for Year	681,748	648,750
Feet of Timber per Ton of Ore	.6538	.5918
Feet Lagging per Ton of Ore	2.6736	2.6003
Feet Poles per ton of Ore	2.2886	2.4619
Feet Lagging per Feet of Timber	4.0897	4.3943
Cost per Ton for Timber	.0575	.0499
Cost per Ton for Lagging	.0243	.0200
Cost per Ton for Poles	.0387	.0338
Cost per Ton for Wire Netting	.0004	.0004
Cost per Ton for Timber, Lagging, Poles & Netting	.1209	.1041
Equivalent of Stull Timber to Board Measure	820,452	848,278
Feet of Board Measure per Ton of Ore	1.2035	1.3075
Lin. Ft. of Netting per Ton of Ore	.0068	.0069
Sq. Feet of Netting per Ton of Ore	.0282	.0286

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7. UNDERGROUND: (CONT.)

d. Timbering: (Cont.)

Total Cost for Timber, Lagging, Poles, etc.

Year	Product	Amount	Cost Per Ton
1942	681,748	82,410.65	.1209
1941	648.750	67,589.93	.1041
1940	515,725	59,589.66	.1155
1939	404,877	47,153.85	.1164
1938	268,050	35,920.27	.1340
1937	443,098	49,763.66	.1123
1936	310,888	35,719.77	.1149
1935	192,534	22,585.11	.1173
1934	162,706	19,546.06	.1201
1933	147,368	11,372.50	.2401

e. Drifting and Raising:

The following table gives comparative figures of drifting and raising for the years 1942 and 1941:

	Drifting			Raising			Grand
Year	Ore	Rock	Total	Ore	Rock	Total	Total
1942	269'	973'	1242'	1858'	578'	2436'	3678'
1941	928'	922'	1850'	1410'	53'	1463'	3313'
Increase		51'		448'	525'	973'	365'
Decrease	659'		608'				

There was a decrease in drifting in 1942 and an increase in raising, making a net increase for the year of 365 feet. Raising on the fourth, seventh, eight and ninth level accounts for the increase.

f. Explosives, Drilling and Blasting:

The cost per pound for powder was the same in 1940, 1941 and 1942. The expenditure for powder increased $809.86 in 1942 while the product increased 32,998 tons. The total cost per ton for powder, fuse and caps was .0011 per ton lower than in 1941 and was exactly the same as in 1940.

Gelamite No. 1 has been used exclusively for the past three years. The fumes are not as objectionable as the fumes from Gelatin Powder and it runs twenty five sticks more to the hundred pound box. There were no changes in the method of handling explosives except that all employees handling them now have to be licensed. A long list of rules for handling explosives, drawn up by the Bureau of Mines, entitled, "Federal Explosives Act" has been passed by Congress and is now in effect. The mine is complying with the regulations as far as is possible.

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7. UNDERGROUND: (CONT.)

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

Statement of Explosives Used: (Ore Development and Stoping)

Kind	Quantity	Average Price	1942 Amount	1941 Amount
No. 1 Gelamite	249,928	11.50	28,741.72	27,931.86
Fuse - feet	1,002,860	5.15	5,164.72	5,208.23
Caps - No. 6	138,565	12.20	1,690.48	1,696.57
Electric Detonators	3,365	11.10	373.68	156.56
Tamping Bags	54,500	2.16	117.88	58.00
Fuse Lighters	23,500	6.75	158.66	185.68
Connecting Wire - lbs.	138	.55	75.90	48.00
Shot firing cord - ft.	500	15.44	7.72	6.60
Total Fuse, etc.			7,589.04	7,360.24
TOTAL ALL EXPLOSIVES			36,330.76	35,292.10
PRODUCT			681,748	648,750
Pounds Powder per Ton of Ore			.3666	.3716
Tons of Ore per lb. of powder			2.7278	2.6909
Cost per Ton for Powder			.0422	.0431
Cost per Ton for Fuse, Caps, etc.			.0111	.0113
Cost per Ton for All Explosives			.0533	.0544
(Sinking, Rock Development, etc.)				
60% Gelatin	1,075	11.50	123.63	109.25
No. 1 Gelamite	7,822	11.50	899.53	703.14
Total Powder	8,897		1,023.16	812.39
Fuse - feet	33,665	5.15	173.38	137.22
Caps - No. 6	4,810	12.20	58.69	45.04
Electric Detonators	135	10.43	14.08	9.08
Shot Firing Cord - ft.	500	15.44	7.72	6.60
Total Fuse, etc.			253.87	197.94
Total All Explosives			1,277.03	1,010.33
Total Explosives used at Mine			37,607.79	36,302.43
Average Price per Pound for Powder			.1150	.1150

g. Mining and Loading

There was an increase in tramming costs of $.028 per ton in 1942 and an increase of $.027 in 1941. The increase in 1942 was due to several causes viz., more ore trammed, more shifts worked, more overtime shifts, and tramming on the five levels as compared with four in 1941. In order to maintain production it was necessary to open the fourth level in 1941, and in 1942, due to mining approaching the seventh level, to put up raises from the eight level and start tramming. The more levels on which ore is trammed the greater the cost. The

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7. UNDERGROUND: (CONT.)

g. Mining and Loading:

cost also increased in 1942 due to more track cleaning account of wet ore spilling from tram cars and one more level to keep clean. It was found necessary to increase the number of skip tenders for short periods during the year when there was sufficient ore available to keep the skips operating at maximum capacity. The combination of all of these factors resulted in an increase in traming cost.

There was no change in mining practice in 1942. Wherever the size of the ore area permits, the raises are located to obtain the maximum economical scraper haulage distance which runs from one hundred to one hundred and thirty feet, depending on the horsepower of the scraper motor and the rope speed. In a few cases ore has been scraped with high speed twenty horsepower scrapers up to distances of nearly two hundred feet and excellant product obtained. Special attention was given in 1942 to covering down the floors of sub levels opened under the hanging above the fourth levels. Slabs were used for covering in several areas with excellant results as less rock runs have occured when the next lower sub level was mined. In two small areas above the fourth level it was necessary to blast down the hanging jasper to start the area caving and to make a cushion over the sub level.

Timber bulk-heads were in general use on the sub levels to prevent breakdowns due to sudden settlement of the timber mat and heavy falls of ground. The heavy operating schedule of seventeen shifts per week does not allow time for the timber mat to settle and compact before mining is underway on the next lower sub level.

h. Ventilation:

E. & A. - AM-6 - "Ventilation Equipment", was authorized in August 1941, the fan and motor was recieved in April 1942, installed on the tenth level and went into operation in June 1942. The new fan has a capacity of 80,000 cubic feet of air per minute and will operate against a pressure of five inches water guage. The motor is 125 horsepower and an extra pulley provides for reduction of output to 60,000 cubic feet per minute. The new fan is located in a by pass drift several hundred feet from the shaft. When operations are resumed on the tenth level, air lock doors in the main haulage drift will permit motor tains to be locked past the fan without disturbing the ventilation in the mine. The location of the new fan is a great improvement over the location of the old fan which was near the shaft. Haulage trains passing the old fan interrupted the air supply due to short circuiting the air. An immediate improvement in the ventilation throughout the mine was noted when the new fan went into commission in June. The amount of air forced through the mine was doubled resulting in an ample volume of fresh air reaching every part of the Mine. Due to the greater volume, temperatures in the mining areas were reduced and working conditions greatly improved.

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7. UNDERGROUND: (CONT.)

h. Ventilation: (Cont.)

The problem of ventilation at the mine no longer hinges on the quantity of fresh air available but on the maintenance of adequate airways between levels. Constant work is necessary to keep the airways in ore open due to the heavy pressure and constant crushing. Additional airways must shortly be provided from the seventh to sixth levels and from the sixth to fourth levels to replace existing airways in the mining areas that will soon have to be abandoned.

i. Pumping:

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

Period	Avg. K.W.Per Day - Athens	K.W.Per Month Breitung Pump	Avg. GalsPer Min. - Athens	Total Cost Both Mines From Athens Cost Sheet
January	4732	3200	399	$2,760.24
February	4087	2400	388	2,229.60
March	4684	1800	373	2,587.11
April	4723	3200	374	2,520.51
May	4313	2900	402	2,441.29
June	4626	2700	402	2,739.06
July	4474	2400	393	2,768.13
August	4334	1300	394	3,317.47 *
September	4400	1600 Est.	384	3,182.63 **
October	4470	1600 "	397	2,500.27
November	4200	2000 "	379	2,510.95
December	4177	2000 "	368	2,468.65

(*) Pumping cost in August 1942 includes $688.00 for cleaning sump.
(**) Pumping cost in September 1942 includes $730.43 for cleaning sump.

Avg. 6Mos. 1935	3103	4366	265	2,087.93
Avg.Year 1936	2949	3583	255	1,766.08
Avg.Year 1937	3003	3283	257	1,749.12
Avg.Year 1938	3767	3433	314	2,350.42
Avg.Year 1939	3991	4391	331	2,291.90
Avg.Year 1940	4141	858	351	2,381.69 *
Avg.Year 1941	4008	1883	354	2,351.56
Avg.Year 1942	4435	2258	388	2,668.91

(*) Cost increased in 1940 account of cleaning the Sump.

Average cost in 1934 prior to pumping at the Breitung	2,611.79
Saving in 1935 when Exp. was heavy acc. of Installing	2,600.59
Saving in 1936	10,148.52
Saving in 1937	10,352.04
Saving in 1938	3,135.96
Saving in 1939	3,838.65
Saving in 1940	2,761.20
Saving in 1941	2,922.76
Saving in 1942	685.44*

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

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7. UNDERGROUND: (CONT.)

i. Pumping: (Cont.)

The water pumped at the Athens Mine in 1942 averaged 388 gallons per minute as compared with an average of 354 gallons per minute in 1941. It averaged higher in 1942 than in any year since the cave to surface in 1933. Two reasons for the increase seem logical, first, extension of the cave to surface Northeasterly on the South side of the property, second, more rainfall in the summer months. More ground water can now enter the mine from the surface caves, This is borne out underground by the heavy inflow on the south side of the mining areas. In an effort to reduce the water coming into the mine two stops were taken this year, first, erection of a concrete tank on surface back of the dry house to catch the water from the shower baths and from washing of the dry floors, second, to cut off some of the ground water south of the cave to surface by installation of one or more deep well pumps in this area. Both of these projects were completed. The water from the dry accumulates in the tank until a float starts an electric automatic pump which pumps the water six hundred feet to the main discharge line from the mine and thus keeps it out of the caved area where it formerly flowed. Six standpipe holes to ledge and churn drill holes into the factured ledge disclosed two likely locations for deep wells and ca twelve inch pipe was sunk near one of these holes 134 feet below surface and a pump installed. This pump has been in steady operation since early in December, pumping about forty five gallons per minute. It has already lowered the ground water six feet in a hole nearby. A pump for a fifteen inch well several hundred feet East was ordered early in November but has not yet arrived. It will be installed as soon as it reaches the mine. It is hoped these pumps will materially lower the ground water level in the area South of the cave to surface and thus prevent an appreciable amount of water from entering the mine. Some pumping was done in October and early November in the first well with a test pump which for a few weeks pumped sixty gallons per minute. It seems certain that a steady flow of about forty five gallons per minute is assured in No. 1 deep well during the winter months with a possible increase to sixty gallons or more per minute for a few months after the spring break up. The gallons pumped at the Athens Mine indicate in November and December but do not positively prove that pumping at the well has already reduced the water entering the mine. There was a decrease of eighteen gallons per minute in November, and eleven gallons in December. The 368 gallons pumped per minute in December was the lowest amount pumped in any month in the year and was twenty nine gallons less per minute thanin December 1941.

The increase in the amount of water pumped in 1942, including the cost of $1418.43 for cleaning the sump at the tenth level pumping plant increased the pumping cost for the year above the cost prior to pumping at the Breitung Shaft in 1934. For the first time since 1934 pumping at the Breitung shaft did not show a saving in cost.

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7. UNDERGROUND: (CONT.)

i. Pumping: (Cont.)

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

Month	1942	1941	1940	1939	1938	1937	1936
January	399	330	325	297	266	244	242
February	388	327	318	282	273	239	244
March	373	324	322	279	277	237	235
April	374	334	318	293	305	242	238
May	402	334	340	338	343	266	261
June	402	367	380	357	364	269	274
July	393	386	420	382	341	271	284
August	394	363	350	375	333	271	266
September	384	363	369	360	336	263	258
October	397	360	373	348	311	262	261
November	379	365	343	334	307	260	255
December	368	397	348	329	309	263	249
Average	388	354	351	331	314	257	256

The following is a log of the churn drill test holes drilled during the year in the area surrounding the surface cave for the purpose of determing a location for deep well pumps:

Hole No. 101W

Depth	Material
0-1'	Surface soil
1'-50'	very fine soil & clay
50'-55'	Gravel & Clay
55'-57'	Broken jasper ledge

Hole Dry

Hole No. 102W

Depth	Material
0-1'	Surface soil
1'-51'	Sand, Clay, Seams & Gravel
51'-55½'	Sandy Clay & Ledge
55½'-98'	Fractured jasper ledge

Static water level at 54½'
No. 2 Well located near this hole

Hole No. 103W

Depth	Material
0-8'	Surface soil
8'-58'	Fine sand & Clay seams
58'-81'	Fractured jasper ledge

Static water level at 52'
No. 1 Well located near this hole

Hole No. 104W

Depth	Material
0-1'	Surface soil
1'-43'	Fine sand, gravel & Clay
43'-94'	Fractured jasper ledge

Static water level at 46½'

Hole No. 105W

Depth	Material
0-5'	surface soil
5'-63'	Fine sand, Seams & Gravel
63'-100'	Fractured jasper ledge

Static water level at 56'

Hole No. 106W

Depth	Material
0-2'	Surface soil
2'-51'	Fine sand, Seams & Gravel
51'-77'	Fractured Diabase dike

Static water level at 48'

Hole No. 107W

Depth	Material
0-½'	Surface soil
½'-23'	Fine sand, Gravel & Boulders
23'-49'	Jasper ledge

Hole dry

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7. UNDERGROUND: (CONT.)

j. Underground in General:

The product in 1942 was mined by an average of twenty six contracts working on a schedule of seventeen shifts per week. Some ore was also obtained from the development work, both drifting and raising which was done by an average of three contracts during the year, but the tonnage from this source was relatively small as a large percentage of the development work was in rock.

Early in the year hoisting conditions were materially improved by adding a skip tending crew of three men on each shift enabling hoisting to be done alternately from two levels and each skip being tended by a crew instead of hoisting from one level at a time as was done formerly with a single crew. The plastic character of the Athens ore cause it to hang up in the chutes and storage pockets when loading from them, particularly after the ore has remained in idle storage for any length of time. The fact that the ore does not run readily, less delays to loading occur when the ore is kept moving and the addition of skip tending crews has resulted in faster loading of the skips and consequently was a factor in obtaining the large product in 1942.

There was an increase in shaft maintenance expense during the year due to the heavy operating schedule. Weekend repairs when the mine was idle were required throughout the year and consisted of two or three crews working two or three eight hour shifts on Sundays depending upon the amount of the repair work. The major part of the shaft repairs were confined to the skip roads in the 1080 feet of circular shaft below the collar. In this portion of the shaft broken members of the steel sets were discovered a number of times during the year and new steel members installed. Also in portions of the circular shaft wear on the runners in the skip roads is more severe then in the remainder of the shaft and consequently requires replacement more often. The mid-week inspection of the skip roads on Thursday morning has proven of value in averting severe breakdowns in the shaft as points of excessive wear were discovered on a number of occasions and immediate repairs made.

8. COST OF OPERATING:

a. Comparative Mining Costs:

	1942	1941	Increase	Decrease
Product	681,748	648,750	32,998	
Underground Costs	1.539	1.453	.086	
Surface Costs	.181	.163	.018	
General Mine Expense	.204	.211		.007
Cost of Production	1.924	1.827	.097	
Taxes	.132	.137		.005
Total Cost	2.056	1.964	.092	
No. of Days Operated	301	296	5	
No. of Shifts & Hours	3-1-8 hr.	25-1-8 hr.		22
	50-2-8 hr.	23-2-8 hr.	27	
	248-3-8 hr.	248-3-8 hr.		
Average Daily Product	2,265	2,192	73	

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8. COST OF OPERATING: (CONT.)

a. Comparative Mining Costs: (Cont.)

Cost of Production:

	1942	Percent	1941	Percent	Increase	Decrease
Labor	1.308	68.0	1.215	66.5	.093 1.5%	
Supplies	.616	32.00	.611	33.5	.005	.005 1.5%
Total	1.924	100.00	1.827	100.00	.097	

b. Detailed Cost Comparison:

(1) Days and Shifts:

Year	Days Mine Worked	Shifts & Hours	Men Employed	Total Shifts Worked
1942	301	2 & 3-8 hr.	419	117,119
1941	296	2 & 3-8 hr.	399	108,860
Increase	5		20	8,259

b. Wages:

(2) There was no change in hourly rate for labor since the increase of ten cents per hour effective April 1st, 1941.

(3) Comparison of Production:

Production - 1942	681,748 tons
Production - 1941	648,750 "
Increase	32,998 "

(4) Comparison of Number of Men and Wages:

	No. Men	No. Days	Amount	Rate per Day
1942	419	117,119	882,242.60	7.58
1941	399	108,860	780,886.82	7.17
Increase	20	8,259	101,355.78	.36

(5) Tons Per Man Per Day:

	1942	1941	Decrease
Surface	33.12	33.84	.72
Underground	7.06	7.23	.17
Total	5.82	5.96	.14

(6) Cost of Production:

	Total	Cost per Ton
1942	1,311,206.12	1.924
1941	1,185,475.84	1.827
	125,730.28	.097

	Labor	Percent	Supplies	Percent
1942	891,228.64	68.0	419,977.48	32.0
1941	788,268.46	66.5	396,499.22	33.5
Increase	102,960.18	1.5	23,478.26	
Decrease				1.5

8. COST OF OPERATING: (CONT.)

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

		1942		1941		Inc. or Dec.	
	Days Per Week	5		5			
	Shifts and Hours	2 & 3-8 hr.		2 & 3-8 hr.			
	Production - Tons	681,748		648,750		22,998	
	Average Daily Product - Tons	2,265		2,192		73	
	Number of Days Worked	301		296		5	
		AMOUNT	PER TON	AMOUNT	PER TON	AMOUNT	PER TON
	UNDERGROUND COSTS:						
1.	Exploring in Mine	741.82	.001	171.32	.000	570.50	.001
2.	Sinking in Shaft						
3.	Development in Rock	16320.91	.024	10862.06	.017	5458.85	.007
4.	Development in Ore	13019.63	.019	15488.39	.024	2468.76	.005
5.	Stoping	327917.67	.481	285666.23	.440	42251.44	.041
6.	Timbering	357575.22	.525	335,547.46	.517	22027.76	.008
7.	Tramming	141235.85	.207	115877.15	.179	25358.70	.028
8.	Ventilation	11392.51	.017	7675.39	.012	3717.12	.005
9.	Pumping	34156.86	.050	28219.19	.043	5937.67	.007
10.	Compressors and Air Pipes	55432.27	.081	55201.13	.085	231.14	.004
11.	Fire & Damage			7593.45	.012	7593.45	.012
12.	Underground Superintendence	30128.53	.044	24481.27	.038	5647.26	.006
13.	Cave-in			328.95	.001	328.95	.001
14.	Maint: Compressors & Power Drills	1362.61	.002	1890.94	.003	528.33	.001
15.	Scraper & Mech. Loaders	29339.89	.043	23615.26	.036	5724.63	.007
16.	Elec. Tram. Equipment	25455.85	.038	22774.81	.035	2681.04	.003
17.	Pumping Machinery	4823.40	.007	7179.81	.011	2356.41	.004
	Total Underground Costs	1048903.02	1.539	942572.81	1.453	106330.21	.086
	SURFACE COSTS:						
18.	Hoisting	50432.45	.074	46200.56	.071	4231.89	.003
19.	Stocking Ore	8610.80	.012	8764.45	.014	153.65	.002
20.	Screening-Crushing at Mine						
21.	Dry House	11807.80	.017	8207.22	.013	3600.58	.004
22.	General Surface Expense	12275.03	.018	8110.50	.012	4164.53	.006
23.	Maint: Hoisting Equipment	26455.27	.039	18262.52	.028	8192.75	.011
24.	Shaft	4533.87	.007	4397.55	.007	136.32	.000
25.	Top Tram Equipment	2810.93	.004	3458.99	.005	648.06	.001
26.	Docks, Trestles & Pkts	2577.76	.004	1688.62	.003	889.14	.001
27.	Mine Buildings	4040.53	.006	6552.95	.010	2512.42	.004
	Total Surface Costs	123544.44	.181	105643.36	.163	17901.08	.018
	GENERAL MINE EXPENSES:						
28.	Insurance	4765.50	.007	4900.14	.008	134.64	.001
29.	Mining Engineering	3368.56	.005	2821.91	.004	546.65	.001
30.	Mechanical & Electrical Engr.	2304.25	.003	2275.22	.004	29.03	.001
31.	Analysis and Grading	20794.35	.031	17185.49	.026	3608.86	.005
32.	Personal Injury	11667.24	.017	16815.60	.026	5148.36	.009
33.	Safety Department	2231.92	.003	1976.70	.003	255.22	.000
34.	Telephones and Safety Devices	4375.38	.006	4547.09	.007	171.71	.001
35.	Social Security Taxes	20574.62	.030	33877.34	.052	13302.72	.022
36.	Spc. Exp., Pensions & Allowances	21744.38	.032	6674.21	.010	15070.17	.022
37.	Ishpeming Office	12471.12	.018	11702.13	.018	768.99	.000
38.	Employees Vacation Pay	20066.91	.030	17,484.35	.027	2582.56	.003
39.	Mine Office	20272.01	.030	16999.49	.026	3272.52	.004
	Total Gen. Mine Expenses	144636.24	.212	137259.67	.211	7376.57	.001
	COST OF PRODUCTION	1317083.70	1.932	1185475.84	1.827	131607.86	.105
40.	Taxes	90130.55	.132	89081.27	.137	1049.28	.005
	TOTAL COST	1407214.25	2.064	1274557.11	1.964	132657.14	.100

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8. COST OF OPERATING: (CONT.)

b. Detailed Cost Comparison: (Cont.)

(7) Detail of Acounts: (Cont.)

1. Exploring in Mine:

Covers a proportions of Geological Department expense. Expense charged to Athens Mine increased $570.50 and cost per ton $.001.

3. Development in Rock:

Total feet of drifting and raising in rock 155 feet in 1942 as compared with 888 feet in 1941. Increase in expense $5,458.85 and in cost per ton $.007. Drifting in 1942, 973 feet; in 1941 835 feet. Raising in 1942, 578 feet; in 1941 only 53 feet.

4. Development in Ore:

There were 659 feet less ore drifting and 448 feet more ore raising in 1942. The decrease in expense was $2,468.76 and in cost per ton $.005 due to the decrease in ore drifting.

5. Stoping:

The increase in expense was $42,251.44 and in Cost per ton $.041. Production increased 32,998 tons and the ten cents increase in wages per hour effective April 1st, 1941 was in effect the twelve months as against nine months in 1941. There was also more overtime paid due to operating two shifts on Saturdays all of 1942, as compared with only part of the year in 1941.

6. Timbering:

The increase in expense was $22,027.76 and in cost per ton $.008. The cost per ton for timber, lagging and poles increased $.0168. There were 2,319 feet raising in 1942 and only 952 feet feet in 1941. Labor repairing raises and main level drifts was less in 1942. More shifts were worked in 1942 and more ore produced.

7. Tramming:

There was an increase in production of 32,998 tons due to more men employed and more shifts worked. The increase in expense was $25,358.70 and cost per ton $.028. Ore was trammed on five levels in 1942 as compared with four in 1941.

8. Ventilation:

The increase in expense was $3,717.12 and in cost per ton $.005. There was a new 80,ooo cubic feet fan and motor installed which practically doubled the capacity of the old fan. The cost for electric power increased $3,467.70.

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8. COST OF OPERATING: (CONT.)

b. Detailed Cost Comparison: (Cont.)

(7) Detail of Accounts: (Cont.)

9. Pumping:

Expense increased $5,937.67 and cost per ton $.007.

Gallons of water pumped in 1942	204,553,558
Gallons of water pumped in 1941	185,835,174
Increase	18,718,384

Average gallons per minute in 1942	388
Average gallons per minute in 1941	354
Increase	34

The cost for electric power was $1,647.57 more than in 1941. There was also a charge of $1,418.45, for cleaning the sump in 1942. The expense for the deep well pump to reduce amount of water reaching the mine along ledge to the cave and for six test holes to ledge, also for a second deep well in which a pump will soon be installed, E. & A. -AM-10, to the amount of $2,130.95 was charged to pumping in 1942.

10. Compressors and Air Pipes;

Expenditures increased $231.14 and cost per ton decreased $.004.

Cubic feet air compressed in 1942	1,351,440,000
Cubic feet air compressed in 1941	1,350,945,000
Increase	495,000

Cost of electric power in 1942	$40,666.69
Cost of electric Power in 1941	41,160.41
Decrease	493.72

11. Fire and Damage:

Expense in 1942 - none
Expense in 1941 - $7,593.45

A fire in the mine in June 1941, incurred an expense of $7,593.45.

12. Underground Superintendence:

The increase in expense was $5,647.26 and cost per ton $.006.

Increase due to adding one more shift boss in 1942 and the two additional shift bosses added last year were employed the full year in 1942. There was an increase in the amount paid for safety bonus due to more men working and more shifts operated and also an increase in the salary of captain and bosses.

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8. COST OF OPERATING: (CONT.)

b. Detailed Cost Comparison: (Cont.)

(7) Detail of Accounts:(Cont.)

13. Cave-in:

Expense in 1942 - None
Expense in 1941 - $328.95, cost per ton $.001.
Expense in 1941 was for fencing to enclose extension of cave on the South side of the mine property.

14. Compressors and Power Drills:

The decrease in expense was $528.33 and cost per ton $.001.

There were two new R. B. -12 Drill machines and four Ingersoll-Rand Jack Legs bought in 1942 as compared with four R. B. - 12 Drill Machines and four Ingersoll-Rand Jack Legs in 1941. There were also less repairs to compressors in 1942.

15. Scrapers and Mechanical Loaders:

The expense in 1942 increased $5,724.63 and cost per ton $.007.

There was one new twenty Horsepower Sullivan Electric scraper hoist and two Holcomb scrapers bought in 1942 as compared with one new fifteen Horsepower Sullivan Electric hoist and three Holcomb scrapers in 1941. There was an increase in cost for wire rope due to more rope used and an increase in the price of wire rope. The cost for repairs to scrapers and scraper hoists increased due to larger product and more shifts worked and to greater age of a number of the hoists.

16. Electric Tram Equipment:

The increase in expense was $2,681.04 and cost per ton $.003.

	G'ators	L'motivs	Wiring	M.L.Track	M.L.Cars
1942	873.70	8,800.79	1,911.10	9,418.58	4,651.68
1941	1,797.03	9,087.65	2,601.92	7,271.81	2,016.40
Increase				2,146.77	2,635.28
Decrease	923.33	286.86	690.82		

Decrease in expense to Generators due to purchasing a second hand generator from the Gardner-Mackinaw Mine in 1941 costing $700.00 and to less repairs. A new generator and motor was bought in 1942 which was charged to E. & A. - AM -7.

Decrease in Locomotives due to less repairs.

Decrease in expense to Wiring due to less repairs and extensions to trolley lines.

Increase in expenditures to Main line Tracks due to more expense for maintenance and cleaning of tracks.

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8. COST OF OPERATING: (CONT.)

b. Detailed Cost Compariosn: (Cont.)

(7) Detail of Accounts: (Cont.)

16. Electric Tram Equipment: (Cont.)

Increase in expense to Main line Cars due to more repairs. In 1942 five cars where overhauled at the General shops while in 1941 only one was overhauled. Four new rocker dump cars were bought in 1942 but were charged to E. & a. AM-9 to be depreciated over a four year period.

17. Pumping Machinery:

Expenditures decreased $2,356.41 and cost per ton $.004. There was a charge for changing the power line to the Breitung pump and repairs to discharge line from Breitung shaft. The decrease in expense was due to charging out the cost of a new surface discharge line amounting to $3,960.14 in 1941.

18. SURFACE COSTS:
Hoisting:

	Ore	Rock	Totals
1942 - Product	681,748 tons	20,690 tons	702,438 tons
1941 - Product	648,750 "	20,630 "	669,380 "
Increase	32,998 "	60 "	33,058 "

Expenditures increased $4,231.89 and cost per ton $.005. The increase in expense was due to hoisting larger product and working more shifts. The electric power charge was $1,681.41 more than in 1941.

19. Stocking Ore:

Tons stocked in 1942 -	225,797
Tons stocked in 1941 -	228,122
Decrease in 1942	2,325

The decrease in expense was $153.65 and in cost per ton $.002.

The decrease in expense was due to less tons stocked on account of earlier opening of shipping season in 1942.

21. Dry House:

The expenditures increased $4,600.58 and cost per ton $.004.

The increase in expense was due to building a concrete tank for drainage water from the dry and installing a pump to pump the water into the mine discharge line. The dry house was also charged with a proportion of cost of installing a booster pump to the city water main to increase the water pressure in shower room at the dry house.

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8. COST OF OPERATING: (CONT.)

b. Detailed Cost Comparison: (Cont.)

(7) Detail of Accounts: (Cont.)

22. General Surface Expense:

Expense increased $4,164.53 and cost per ton $.006. The increase in expense was due to adding another policeman and paying half the cost of police uniforms for all the policemen, installing floodlights on surface and the cost of electric current to operate them, all of which was done to decrease the danger of sabotage. There was also an increase in expense for removal of snow.

23. Hoisting Equipment:

	Electric Hoists	Hoisting Ropes	Skips and Skip roads	Sheaves
1942	10,567.52	6,905.67	7,656.32	1,325.76
1941	7,618.15	4,512.22	5,320.68	811.47
Increase 1942	2,949.37	2,393.45	2,335.64	514.29

The expenditures increased $8,192.75 and cost per ton $.011.

During the year the motor on the skip hoist generator set was burnt out and had to be sent to Milwaukee for rewinding at a cost of $3,450.00. New spiders for the skip hoist drum were authorized under E. & A. - AM-11 and the expense incurred to December 31st was $1,500.74 charged to Hoisting Equipment. The installation of the spiders was started on December 31st, 1942 and completed on January 4th, 1943.

In 1942 four one and three eighths inch skip ropes costing $5,704.54 and one one and one quarter inch cage rope costing $1,201.13, was charged out. In 1941 two one and three eighths inch skip ropes and one one and one quarter inch cage rope we charged out.

The increase in expenditures for skips and skip roads was due to more repairs to the skips and for replacing shaft runners in the skip roads.

The increase in expense for sheaves due to replacing one of the head frome sheaves.

24. Shaft:

There was an increase in expenditures of $136.32 while the cost per ton remained the same.

	Steel Sets	U.G. Pockets
1942	1,410.82	3,113.05
1941	1,181.90	3,215.65
Increase 1942	228.92	
Decrease 1942		102.60

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8. COST OF OPERATING: (CONT.)

b. Detailed Cost Comparison: (Cont.)

(7) Detail of Accounts: (Cont.)

24. Shaft: (Cont.)

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

25. Top Tram Equipment:

There was a decrease in expense of $648.06 and cost per ton $.001.

	Engines & Motors	Wire Rope	Sheaves Rollers etc.	Tracks & Cars
1942	400.10	1,079.94	705.65	619.84
1941	121.75	1,299.31	700.94	1,336.99
Increase 1942	278.35		4.71	
Decrease 1942		219.37		717.15

The increase in expense for Engines and Motors due to charging out a new circuit breaker and more repairs to engines.

There was a decrease in expense for Wire Rope due to less ore stocked.

The decrease in expenditures for tracks and cars was due to rebuilding a top tram car in 1941.

26. Docks, Trestles and Pockets:

The increase in expenditures was $889.14 and the cost per ton $.001.

There were more repairs to skip dumps in shaft house and to surface ore pockets, and also more expense for maintenance of the rock trestle.

27. Mine Buildings:

Building	1942 Amount	Remarks
Office	506.89	Plastering office and remodeling furnace room
Shops	62.82	Repairing windows and doors.
Shaft House	22.08	Repairing windows.
Engine House	352.79	Repairing windows and making screens, Painting.
Heating Plt Bldg.	45.10	Repairing roof.
Dry House	2862.39	Additions and alteration, painting, new hot water tanks.
Timber Tunnel	22.24	Repairing doors and windows
Top Tram Bldg.	8.01	Repairing windows.
Storage Bldg.	157.91	Plastering and repairing laboratory bldgs.
Total	4040.53	

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8. COST OF OPERATING: (CONT.)

b. Detailed Cost Comparison: (Cont.)

(7) Detail of Accounts: (Cont.)

27. Mine Buildings: (Cont.)

1941

Building	Amount	Remarks
Office	313.81	Plastering and Decorating
Shops	360.08	New doors and repairs to windows and brick work.
Shaft House	15.53	Repairing windows
Engine House	576.52	New windows, painting, and repair brick work.
Heating Plt Bldg.	10.04	Repairs to windows.
Dry House	5161.07	Additions and alterations.
Coal dock	9.15	Repair bracing.
Timber Tunnel	34.00	Repairs to doors.
Storage Bldg.	72.75	Moving partitions and change doors.

GENERAL MINE EXPENSE:

28. Insurance:

	Property	Group	Catastrophe
1942	2,379.09	1,641.99	610.26
1941	2,254.97	2,105.58	538.25
Increase 1942	124.12		72.01
Decrease 1942		463.59	

The expense to this account decreased $134.64 and cost per ton $.001.

29. Mining Engineering:

Covers time and expense of Mining engineers and helpers.
The expense to this account increased $546.65 and the cost per ton $.001.

30. Mechanical & Electrical Engineering:

The increase in expense to this account was $29.03 and the cost per ton decreased $.001.
This charge to this account covers the time spent by Mechanical and Electrical department men on inspections and repairs.

31. Analysis and Grading:

	Sampling at Mine	Central Laboratory exp.	Shipping Dept Exp	Trucking Samples etc.
1942	5,078.49	11,638.42	3,223.87	853.57
1941	4,660.17	8,876.55	2,991.13	657.64
Increase	418.32	2,761.87	232.74	195.93

Determinations 1942 - 31,679, cost per determination $.367386
Determinations 1941 - 27,572, cost per determination .321941

The increase in expenditures to this account was $3,608.86 and cost per ton $.005.

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8. COST OF OPERATING: (CONT.)

b. Detailed Cost Comparison:(Cont.)

(7) Detail of Accounts: (Cont.)

32. Personal Injury:

	Compensation and Doctors	Compensation Department	Hospital Loss
1942	6,252.67	718.57	4,696.00
1941	10,510.17	744.41	5,561.02
Decrease 1942	4,257.50	25.84	865.02

There was a decrease in expense to this account of $5,148.36 and cost per ton $.009.

33. Safety Department:

	First Aid Supplies	First Aid and Helmet Practice	Ishp. Office Charge
1942	291.43	69.41	1,871.08
1941	243.50	81.10	1,652.10
Increase	47.93		218.98
Decrease		11.69	

The expense to this account increased $255.22 while the cost per ton remained the same.

34. Telephones and Safety Devices:

Expenditures to this account decreased $171.71 and cost per ton $.001.

	1942	1941	Increase	Decrease
Lights at Shaft & Levels	3,817.76	3,951.27		133.51
Mine Telephones	208.38	227.80		19.42
Safety Gates	216.80	231.14		14.34
Sign Boards & Signals	109.51	91.71	17.80	
Fire Equipment	22.93	45.17		22.24

35. Social Security Taxes:

	Unemployment Insurance	Old Age Benefit Tax
1942	11,661.01	8,913.61
1941	25,998.88	7,878.46
Increase 1942		1,035.15
Decrease 1942	14,337.87	

The decrease in expense was $13,302.72 and cost per ton $.022. The expense in this account is based on the amount of the payrolls. The decrease in Unemployment Insurance Tax was due to a new factor used in 1942 based on experience rate and was effective as of January 1st, 1942 while in 1941 it was three percent. The Old Age Benefit Tax was one percent of payrolls for both years and the increase in 1942 was due to more shifts worked and more men employed.

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8. COST OF OPERATING: (CONT.)

b. Detailed Cost Comparison: (Cont.)

(7) Detail of Accounts (Cont.)

36. Special Expense, Pensions and Allowances:

	1942	1941	Increase	Decrease
Legal	428.67	362.85	65.82	
Saranac Investigation	1933.42	2278.36		344.94
Curtailment		7.75		7.75
Retirement	1565.60	1355.84	209.76	
Collar to Collar	6088.33		6088.33	
Other Expense	11728.36	2635.41	9092.95	

There was an increase in expenditures of $15,070.17 and cost per ton $.022. In the item of other expense there is included the payments made for "Collar to Collar" time given underground employees in adjusting hours worked in excess of eight hours per day, made necessary by Cleveland Office.

37. Ishpeming Office:

Ishpeming office expense is prorated to various mines on basis of labor.

There was an increase in expense of $768.99 and the cost per ton remained the same.

38. Employees Vacation Pay:

The expense to this account increased $2,582.56 and cost per ton $.003.

In 1942 employees with three years service received one week vacation pay and those with ten years service received two weeks vacation pay.

39. Mine Office:

	1942	1941	Increase	Decrease
Salaries	13,944.65	12,340.20	1,604.45	
Central Warehouse	5,083.89	3,360.29	1,723.60	
Miscellaneous	1,243.47	1,299.00		55.53

The increase in expenditures was $3,272.52 and cost per ton $.004.

There was an adjustment in salaries in March 1942 and the extra clerk added in July 1941 worked the twelve month of 1942. There was also a charge for clerical work assembling data on the wage and hours record and time of typist typing finger print records.

The increase in Central Warehouse Expense was due to a charge of $1,377.94 interest on investment.

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8. COST OF OPERATING: (CONT.)

B. Detailed Cost Comparison: (Cont.)

(7) Detail of Accounts: (Cont.)

40. Taxes:

There was an increase in taxes levied of $1,049.28 and the cost per ton decreased $.005.

The increase in taxes was due to a higher assessment value on realty. The tax rate was slightly lower than in 1941. The decrease in cost per ton was due to the large product.

9. EXPLORATIONS AND FUTURE EXPLORATIONS:

There was no diamond drilling on the Athens property in 1942 and no explorations are under consideration at this time.

10. TAXES:

	1942		1941	
	Valuation	Taxes	Valuation	Taxes
Realty (State Tax Commission)	2,270,000	74,177.24	2,155,000	71,564.97
Ore in Stock, Equip., Supplies.	455,000	14,868.13	495,000	16,438.36
Sterling Addition	4,600	150.31	4,600	152.77
Harvey Plat	1,300	42.49	1,300	43.18
Total	2,730,900	89,238.17	2,655,900	88,199.28
Collection fees		892.38		881.99
Total Optg. Athens Mine	2,730,900	90,130.55	2,655,900	89,081.27
Rented Buildings:				
Harvey Plat	4,400	143.78	4,700	156.11
Sterling Addition	23,700	774.46	22,800	757.25
Total	28,100	918.24	27,500	913.36
Collection fees		9.18		9.13
Total Rented Buildings	28,100	927.42	27,500	922.49
Total Athens Iron Mng. Co.	2,759,000	91,057.97	2,683,400	90,003.76
Total Taxes City of Negaunee		542,187.64		483,960.09
Tax Rate Per $100.00 of Valuation		3.267		3.321
Athen Iron Mng. Co. Percent of Taxes		16.79%		18.59%

The Valuation of realty set by the State Tax Commission was increased $115,000 in 1942 as compared with 1941, while the valuation of personal property was decreased $40,000. The net increase in Valuation 1942 was $75,000. Due to a slight decrease in the tax rate the actual increase in taxes was only $1,054.21

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11. ACCIDENTS AND PERSONAL INJURY:

The following table gives the number and classification of the accidents causing personal injury for the past six years:

	1942	1941	1940	1939	1938	1937
Fatal			1		1	
Time Lost - Over 4 months	2	1	1		1	1
- 1 to 4 months	9	7	4	5	3	5
- Less than 1 month	5	10	5	3	1	1
Total Accidents	16	18	11	8	6	7
Number of cases paid compensation for accidents prior to Jan. 1st each year	4	4	4	5	7	7
Number of cases paid difference in wages (included in above total.)	2	2	3	2	3	3

Nature and Classification of Compensable Accidents:

Date	Remarks	Days Lost
1-3-42	Foreign body, right eye	5
3-5-42	Bruised right foot	32
3-9-42	Loss one half left second finger	42
5-15-42	Loose cartilage, right knee	117
5-25-42	Lacerated right hip	4
6-1-42	Scalp wound concussion	26
6-3-42	Bruised back left leg and foot	36
7-22-42	Fracture bone right foot	40
8-6-42	Back injury	Home
8-14-42	Fracture two toes left foot	36
9-9-42	Compound fracture, two bones right foot	Home
9-14-42	Fracture right patella	71
10-1-42	Bruised right foot	4
10-27-42	Laceration right thumb.	23
12-10-42	Fracture bone left hand	Home

There were 16 compensable accidents in 1942 as compared with 18 in 1941. The days lost on account of injuries incurred in 1942 exceeded the days lost in 1941 although there were two less compensable accidents in 1942. The severity rate was higher in 1942 per one thousand man days. The labor turn over in 1942 was much greater than in 1941 and more days were worked. These two factors increased the probability of accidents. Most of the accidents were due to falls of ground which is the greatest hazard in a soft ore mine where crushing is severe and the ore is soft and slabby.

Close supervision is maintained by the Captain and Bosses and the men are disciplined for infraction of rules and unsafe methods of doing the work. During the year a number of meetings were held for discussion of accidents, safety rules and the mining standards.

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION

The following is a list of the active E. & A.'s during 1941:

E. & A. No. AM-6 - Ventilation Equipment:

	Amount Authorized	Amount Expended	Unexpended Balance
Fan - 80,000 Cu. ft.	1,400.00	1,261.00	139.00
Rope drive and Extra Pulley	400.00	259.30	140.70
Motor - 125 H. P.	1,250.00	1,958.88	708.88
Foundation for Fan & Motor	150.00	190.60	40.60
Installation	300.00	724.93	424.93
150' Rock Drift-Tenth Level	2,700.00	3,955.26	1,255.26
Concrete Seal at Fan Outlet	100.00	171.28	71.28
Two Air Lock Doors	750.00	208.82	541.18
Total	7,050.00	8,730.07	1,680.07
10% for Contingencies, S. S., etc.	705.00	94.93	610.07
Grand Total	7,755.00	8,825.00	1,070.00

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

Following is a list of the active E. & A.'s during 1942:

E. & A. No. Am-6 - Ventilation Equipment: (Cont.)

This authorization covers cost of an 80,000 cubic feet fan and installation on the tenth level. The work of preparing for installation was started in December 1941. The cost exceeded the estimate due to higher price paid for the 125 Horsepower motor and greater cost of 150 foot rock drift necessary to prepare station for the fan, also cost of installation was greater than had been estimated. This E.&A. was closed in July 1942.

E. & A. - No. AM-7 - Motor Generator Set.

	Amount Authorized	Amount Expended	Unexpended Balance
150 K. W. Generator Set	4,400.00	4,307.60	92.40
Starting Panel	700.00	689.92	10.08
D. C. Control Panel	300.00	317.00	17.00
Installation, etc.	350.00	1,206.94	856.94
Total	5,750.00	6,521.46	771.46

This E. & A. was authorized in 1941 and completed in 1942. The old set burned up and a new on of larger capacity was provided by this E. & A. The expenditures exceeded the estimate in the cost of installation

E. & A. - AM-8 - Purchase Six Holcomb Westeeco Scrapers:

	Amount Authorized	Amount Expended	Unexpended Balance
6 Scrapers	1,200.00	408.77	791.23

Up to the end of the year only two scrapers on the above order had been delivered. The delay is due to difficulty in obtaining the necessary alloy steel for manufacture of the scrapers.

E. & A. - AM-9 - Purchase Four Rocker Dump Cars:

	Amount Authorized	Amount Expended	Unexpended Balance
4 Rocker Dump Cars	2,800.00	2,833.44	33.44

This E. & A. was authorized on August 7th, and the cars were delivered to the mine in December 1942.

The expenditure exceeded the estimate by the cost of delivery of the cars which was not included in the orginal estimate.

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

E. & A. - AM-10 - Test Holes For Drainage Wells:

	Amount Authorized	Amount Expended	Unexpended Balance
10 Holes at 70' each	2,100.00	1,556.00	544.00
Pipe & Misc. supplies	875.00	574.95	300.05
10 % for Contingencies	295.00		295.00
Total	3,270.00	2,130.95	1,139.05

A total of six test holes were sunk by the Layne Northwest Company to ledge and drilled into the ledge a short distance. It is possible that one or more additional test holes will be sunk in 1943.

E. & A. - AM-11 - Skip Hoist Drum Spiders:

	Amount Authorized	Amount Expended	Unexpended Balance
2 Cast Iron Split Spiders	1,000.00	1,265.31	265.31
Installation	350.00	235.43	114.57
Total	1,350.00	1,500.84	150.74

Installation of the two spiders was started on the morning of December 31st. and was completed a few days later, first week January 1943. The E. & A. will be closed in January 1943.

E. & A. - AM-12 - Sinking Three Deep Wells:

	Amount Authorized	Amount Expended	Unexpended Balance
No. 1 Well:			
Sinking Pipe & Drill Ledge	938.00	938.00	
Pipe, Misc. Supp. etc.	400.00	550.98	150.98
Developing Well	425.00	611.00	186.00
Pump, Motor, etc.	635.00	15.30	619.70
Elec. Suppl. & Labor	500.00	183.82	316.18
10% for Contingencies	289.80	.46	289.34
Total No. 1 Well	3,187.80	1,959.87	888.24
No. 2 Well:			
Sinking Pipe & Drill Ledge	645.00		645.00
Pipe & Misc. Supplies	450.00	289.08	160.92
Developing Well	425.00		425.00
Pump, Motor, etc.	650.00		650.00
Electrical Work	150.00	56.39	93.61
House for Pump	50.00		50.00
10% for Contingencies	237.00	1.13	235.87
Total No. 2 Well	2,607.00	295.88	2,260.40
No. 3 Well:			
Estimated Cost	3,000.00		3,000.00
Grand Total	8,794.80	2,646.16	6,148.64

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

E. & A. - AM - 12 - Sinking Three Deep Wells: (Cont)

Number one Well has been completed and operating since early in December. Number two Well has been drilled and cased to ledge with fifteen inch pipe. It was drilled seventy seven feet in the ledge and dynamite used to chamber the rock. The pump and motor have been ordered but as yet has not been delivered. There will be some additional charges to Number one Well. The sinking of Number three Well will depend on the results of continuous pumping at Number one and Number two Wells.

This E. & A. must therefore be kept open in 1943.

13. EQUIPMENT AND PROPOSED EQUIPMENT:

a. Steam Shovels:

The ore shipped from stockpiles was loaded by No. 43 shovel owned by the Cleveland Cliffs Iron Company and rented to the Athens Iron Mining Company.

b. Scraper Hoists:

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

	Total on Hand 12-31-42	Repair Cost per Machine 1942	1941
Sull. 15 H.P. Elec.	18	215.13	159.28
" 20 H.P. "	3	82.48	214.50
" 25 H.P. "	1		
Ing. 15 H.P. "	6	79.85	115.41
" 20 H.P. "	7	129.40	26.23
Total	35	157.28	122.71

In 1942 one twenty Horsepower Sullivan Electric high speed Scraper Hoist was purchased and two Holcomb Westeco Scrapers. Repairs expense was higher due to the heavy operating schedule and greater age of the scraper hoists. A number of the hoists were purchased over ten years ago.

c. Drill Machines:

In 1942, two R. B. 12 Ingersoll-Rand auger drill machines were purchased and four J. R.-1 Jack Legs, as compared with four Auger drills and four Jack legs in 1941. In both years they were charged out to operating cost.

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13. EQUIPMENT AND PROPOSED EQUIPMENT: (CONT.)

d. Motor Haulage: Cars:

On account of the large production from this property which made it necessary to operate on a number of levels, it was necessary to purchase four Rocker Dump tram cars in 1942. They cost $708.18 each and were charged to operating cost.

e. Timber Hoists:

In 1942, two HU Utility four cylinder air powered timber hoists were purchased to replace old timber hoists that had worn out after twenty years service. On electric hoist was also purchased in 1942 and will be installed in the timber tunnel at the shaft. It will be used for pulling loaded timber trucks on the cage. It replaces a small air powered hoist that does not operate efficiently in the winter due to freezing account of water in the air.

f. Pumps:

In 1942, two small electric pumps were purchased for pumping the waste water from the dry house to the mine water discharge line at a point near the collar of the shaft. The water from the shower baths and from washing the dry floors is caught in a concrete tank one hundred feet South of the Dry house where the pumps are located.

One deep well pump was purchased in 1942 and installed in December at No. 1 Deep Well. A deep well pump has also been ordered for No. 2 Well but it had not been delivered at the end of the year.

14. MAINTENANCE:

a. Steel Trestles:

The plank floor on the permanent steel trestle east of the shaft had to be replaced in 1942 account of rotting. It is installed in a section of the trestle directly above the main line railroad track and a road passing by the shaft. The plank closed the openings between the decking timber and prevents ore spilled from the top tram cars from falling and injuring trainmen and company employees using the roadway.

b. Comparison of Costs - 1942 with 1941:

Maintenance and repairs listed under underground costs:

	Amount	Cost per Ton
1942	60,981.75	.090
1941	55,460.82	.085
Increase	5,520.93	.005

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14. MAINTENANCE:

b. Comparison of Costs - 1942 with 1941: (Cont.)

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

	1942	1941	Increase	Decrease
Comp. & Power Drills	1,362.61	1,890.94		528.33
Scraper Equipment	29,339.89	23,615.26	5,724.63	
Elec. Tram Equip.	25,455.85	22,774.81	2,681.04	
Pumping Machinery	4,823.40	7,179.81		2,356.41
Total	60,981.75	55,460.82	5,520.93	

Expense for maintenance of Compressors and Power drills decreased in 1942 due to less drill machines purchased in 1942. In 1942 two R. B.- 12 Auger drills and four Jacklegs were purchased as compared with four R. B. -12 Auger drills and four Jacklegs in 1941.

Expense for scraper equipment increased due to purchase of a twenty Horsepower scraper hoist in 1942 as compared with purchase of a fifteen Horsepower hoist in 1941. Two Holcomb-Westeeco scrapers were bought in 1942 as compared with three in 1941. The heavy operating schedule increased the cost for repair of scraper equipment and more wire rope was used account of larger production and more shifts worked.

Expense for electric tram equipment and repairs was greater than in 1941, in two of the sub accounts, "Main Line Tracks" and "Main Line Cars". In sub accounts Generators, Locomotives and Wiring there were small decreases. Expense for tracks increased due to more track cleaning required on account of more wet ore trammed and expense for lowering tracks due to pressure and swelling ground. Expense for main line cars increased due to purchase of four new Rocker dump cars in 1942.

Expense for pumping machinery decreased in 1942 due to expense in 1941, amounting to $3,960.14 for a new discharge line on surface.

Maintenance and repairs listed under surface costs:

	1942	1941	Increase	Decrease
Amount	34,360.65	22,638.52	11,722.11	
Cost per Ton	.053	.045	.008	

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

	1942	1941	Increase	Decrease
Hoisting Equipment	26,455.27	18,262.52	8,192.75	
Shaft	4,533.87	4,397.55	136.32	
Top Tram Equipment	2,810.93	3,458.99		648.06
Docks, Trestles & Pkts	2,577.76	1,688.62	889.14	
Mine Buildings	4,040.53	6,552.95		2,512.42
Total	40,418.36	34,360.63	6,057.73	

Maintenance expense listed under Surface costs increased in three of the accounts and decreased in two accounts. The net increase was 18 percent above the cost in 1941.

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14. MAINTENANCE AND REPAIRS: (CONT.)

b. Comparison of Costs - 1942 with 1941: (Cont.)

Under Hoisting equipment expense for electric hoists increased due to repair of the motor on the skip hoist generator set which had to be sent to Milwaukee for rewinding at a cost of $3,450.00. Expense for new Spiders for the skip hoist drum amounting to $1,500.74 was charged in December 1942. Expense for Hoisting ropes increased due to charging out four one and three eighths inch skip rope and one cage rope in 1942 costing $6,905.67 as compared with two skip ropers and one cage rope in 1941, costing $4,512.22. Expense for maintenance of the skip roads was greater in 1942 and also cost of repairs to the skips due to the heavy operating schedule. The breaking of the axle of one of the eight foot head sheaves increased the expense for sheaves $514.29.

Expense for maintenance of the shaft increased slightly in 1942 and was above normal in both years due to the heavy operating schedule. The greater part of the expense was incurred in the circular shaft where the steel sets in the skip roads occasionally break and the runners wear very fast due to the roads not being exactly plumb.

Expense for equipment and maintenance of the top tram decreased in 1942 due mainly to less expense for rebuilding top tram cars and less wire rope charged out account of less ore stocked.

Expense for Dock, Trestles and Pockets increased due to more repairs to the skip dumps and chutes in the shaft House and to more repairs to the shaft house ore pockets.

Expense for maintenance of mine buildings decreased due to more charges in 1941 for remodeling the Dry house. Expense in 1942 was high also due to completing the work on the Dry house.

15. POWER:

Detail of electric current purchased compared with 1941:

	1942 - 12 Mos. Optg.		1941 - 12 Mos. Optg.	
	Cost	Per Ton	Cost	Per Ton
Stoping	2,786.21	.004	2,451.63	.004
Ventilation	7,203.08	.011	3,735.38	.006
Pumping	22,507.60	.033	20,860.03	.032
Hoisting	36,475.72	.054	34,794.31	.054
Stocking	885.78	.001	855.41	.001
Dry House	756.14	.001	242.97	.000
Lights at Levels	2,162.94	.003	2,562.39	.004
Compressor	40,666.69	.060	41,160.41	.063
Electric Haulage	3,812.85	.006	3,853.03	.006
Shops	310.93	.000	603.85	.001
Heating Plant	16.09	.000	16.35	.000
Office	27.85	.000	23.60	.000
Storage Battery Loc.	33.77	.000	35.49	.000
Surface Lights	208.95	.000		
Total	117,854.60	.173	111,194.85	.171

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15. POWER: (CONT.)

Detail of electric current purchased compared with 1941

	1942	1941
Main Line Meter - K. W.	8,946,701	8,312,932
Separate Meter Readings	8,773,487	8,175,166
Line Loss	173,214	137,766
Product	681,748	648,750
K. W. Per ton (Inc. Line Loss)	13.12	12.81
Cost Per I. W. (Avg.)	.01317296	.0133761
15 Min. Demand (Avg.)	1585	1528
Load Factor (Avg.)	64%	61%

The cost per ton for electric power was slightly higher in 1942, however, the load factor improved and the cost per Kilowatt was lower. The largest individual increase was in the current used in ventilation due to installation of a new fan of larger capacity than the old fan.

17. CONDITION OF PRESMISES:

a. Grounds:

The grounds around the mine buildings were kept in good condition. The encroachment of the cave to surface at the West end of the timber yard was offset by grading an additional stocking area for poles and lagging to the South of the old timber yard. A road was made to the elevated railroad tracks north of the timber yard and stull timber brought in by truck is now unloaded here on the skid ways.

b. Athens Mine Houses:

The following statement gives the total cost of repairs and the average cost per house for 1942 and 1941:

Year	No. Houses	Cost of Repairs	Avg. Cost per House	Rental Income
1942	31	4,459.49	143.85	5,049.13
1941	30	3,830.69	127.69	4,884.80

One house located on Ann Street near the mine was purchased in 1942. Extensive repairs to this house and one other house accounts for the major portion of the expense for repairs incurred in 1942.

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18. NATIONALITY OF EMPLOYEES:

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

As to Parentage	1942	Percent	1941	Percent
English	66	15.8	59	14.8
Finnish	171	40.8	175	43.8
Italian	70	16.7	69	17.3
Swedish	33	7.9	31	7.8
French (France)	1	.2	1	.2
French (Canadian)	43	10.3	35	8.8
Scotch	4	.9	2	.5
German	7	1.7	3	.8
Austrian	7	1.7	6	1.5
Norwegian	7	1.7	7	1.8
Irish	3	.7	4	1.0
Greek	1	.2	1	.2
Danish	2	.5	2	.5
Polish	3	.7	1	.2
Yugoslavian	1	.2	3	.8
Total	419	100.0	399	100.0

	American Born		Foreign Born	
As to Birth	1942	1941	1942	1941
English	54	46	12	13
Finnish	122	119	49	56
Italian	34	31	36	38
Swedish	29	26	4	5
French (France)	1	1	0	0
French (Canadian)	42	34	1	1
Scotch	4	2	0	0
German	7	3	0	0
Austrian	5	4	2	2
Norwegian	7	7	0	0
Irish	3	4	0	0
Greek	0	0	1	1
Danish	2	2	0	0
Polish	3	1	0	0
Yugoslavian	1	3	0	0
Total	314	283	105	116
	74.9%	70.9%	25.1%	29.1%

JACKSON LEASE - CAMBRIA MINE
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1. GENERAL

Mining on the Jackson Lease was increased considerably during the year. The number of miners employed was increased 25% and production 72%.

No work was done during the year in the high sulphur area so that our information concerning its extent is still obscure. I still think that the high sulphur is laid down in a horizontal plane and that it extends downward from a level 55 feet above the 7th Level.

There were some changes made in the operating personnel in January. Mr. A. J. Christenson was made superintendent of the Cambria and also their operations in the Iron River District. Mr. Flannigan who was superintendent for the past several years is now assistant to Mr. Christenson. This change was probably due to the fact that Mr. Flannigan has been in very poor health for some time and has been somewhat incapacitated for active duty.

Mr. Christenson seems to be a very active and capable manager and very cooperative with me in ironing out our differences of opinion in mining operations. On several occasions I have disapproved of some of their operations and brought it to his attention and he has always given my opinion consideration and accepted my recommendations.

There was one fatal accident in the Jackson Lease during the year. This occurred on the 14th of July in the East riser of the Main Deposit and the victim was Dominic J. Baggiore of Ishpeming. This gang in retreating had robbed both sides of the drift, which is the customary procedure in the Gogebic System of mining, leaving a pillar standing on top of the drift timber. This pillar broke loose from behind and in so doing rode forward pushing the cap off from its legs and crushing the one man who was working underneath.

2. PRODUCTION - SHIPMENTS - INVENTORIES

a. Production by Grades

Grade	Tons	% of Product
Cambria (Non-Bessemer)	212,828	100
Violet (Bessemer)	0	0
Total	212,828	100

The total production from the Jackson since the lease became operative has been a Cambria (non-bessemer) grade and is as follows:

1942 Tons	1941 Tons	1940 Tons	1939 Tons	1938 Tons	1937 Tons	1936 Tons	Total Tons
212,828	123,698	92,669	62,328	21,662	66,116	7,791	587,092

b. Shipments

Grade of Ore	Pocket Tons	Stockpile Tons	Total Tons	Total Last Year
Cambria (Non-Bessemer)	147,360	56,339	203,699	124,970

The following statement shows the difference in ore shipped and the minimum shipments as prescribed in the mining lease since it became operative.

YEAR	SHIPMENT	MINIMUM	DIFFERENCE
1936	2,325	66,667	-63,342
1937	61,008	100,000	-38,992
1938	00	100,000	-100,000
1939	79,953	100,000	-20,047
1940	91,690	100,000	-8,310
1941	124,970	100,000	24,970
1942	203,699	100,000	103,699
Total	563,645	666,667	-103,022

c. Stockpile Inventories

Grade of Ore	Dec. 31st. 1942	Dec. 31st. 1941	Increase
Cambria (Non-Bessemer)	23,447	14,318	9,129

d. Production by Months

Month	Cambria Ore Tons	Rock Tons
January	9,809	665
February	9,290	517
March	11,597	45
April	15,248	444
May	13,184	670
June	20,575	155
July	16,805	221
August	21,522	148
September	25,010	442
October	28,588	517
November	21,436	616
December	19,764	230
Total	212,828	4,670

3. ANALYSES

The following are the analyses of the Cambria Ore produced from the Jackson Lease during 1942. These figures are compiled from the daily average analyses. The tonnage factor being used for underground cars is still 2.35 tons.

Month	Grade	Cars	Dried Iron	Dried Phos.	Dried Silica	Moisture
January	Cambria	4,174	58.10	.068	11.02	16.18
February	"	3,953	57.59	.077	11.01	14.76
March	"	4,935	58.68	.082	9.32	15.00
April	"	6,226	57.52	.073	11.17	15.22
May	"	5,383	57.87	.077	11.24	14.72
June	"	8,392	57.84	.082	10.99	15.66
July	"	7,412	57.79	.073	11.28	16.78
August	"	8,733	57.29	.075	11.82	14.99
September	"	10,502	58.23	.065	11.16	14.38
October	"	12,034	57.49	.066	12.10	14.13
November	"	8,433	58.13	.071	10.84	13.81
December	"	8,359	57.78	.074	10.42	14.45
Total		88,536	57.83	.073	11.14	14.90

3. ANALYSES (Cont'd)

These 88,536 cars represent 212,828 tons produced and gives a calculated car factor of 2.404 tons for 1942.

6. SURFACE

Shipments from stockpile were started in March and completed in November, - the entire pile having been loaded out. The customary stocking trestles were erected.

7. UNDERGROUND

a. General

The average monthly production was 17,736 tons as compared to 10,308 tons in 1941 and represents an increase of 7,428 tons or 72.06%. This increase was due to a 24.75% increase in the number of miners employed, less development work and more mining places.

The following table shows the number of 8 hour shifts worked, average number of miners employed and the average number of tons produced per miner per 8 hour shift.

Month	8 hr. Shifts Worked	Avg. No. of Men Per 8 hr. Shift	Tons per Miner Per 8 hr. Shift
January	70	15.63	8.96
February	64	19.00	7.64
March	66	19.09	9.20
April	66	22.82	9.71
May	67	25.40	7.43
June	74	26.19	10.18
July	74	18.03	13.05
August	70	19.28	15.21
September	74	21.62	15.43
October	76	21.58	17.24
November	69	17.54	16.37
December	68	19.44	14.86
Monthly Average	69.83	20.47	12.11
Monthly Average 1941	71.92	16.41	8.69

The increase in tons per miner per 8 hour shift, as shown in the foregoing table is due to the fact that considerable more stoping and less development work was done this year as compared with 1941.

b. Development

Developments this year have not found any new ore bodies but have increased the area of those partially developed and the upward extension of the south riser. This riser was developed to a height of +503' or 390' above the 6th Level on the south side of the main south dike and +450' or 377' above the 6th Level on the north side of the north fork of the south dike. Last year it was assumed that the south dike was the southern limit of the ore body but from these developments and several drill holes it is proven that the ore extends south of the dike.

New Sub-Levels started this year are the +435'Sub, 390', 370' and the 350' Subs in the south riser and the 50' Sub in the central part of the Main Deposit.

The following is a detailed report by Subs:

435' Sub-Level

A drift was driven 133' northeasterly to the northern limit of the ore. At this elevation the ore body was divided into two chimneys, - the northern one extending 20' above the Sub and the Southern one 33'.

390' Sub-Level

This Sub required considerable development work to escape breaking any more dike than necessary as the entire area is full of dike running in all directions. First, drifts were driven northwest and southeast from the raise to foot and hangingwall. Then a drift was driven 67' easterly from a point 17' northwesterly from the raise, between the main south dike and the north fork of the dike. From the end of this drift, a drift was driven 35' north to footwall crossing the said north fork.

370' Sub-Level

Developments on this Sub consisted of drifting 93' southwesterly from a raise, located at 237' South and 3582' East, holing to the main development raise at 265' South and 3528' East from which raise a drift was driven 68' southeasterly to the footwall. Then from the raise at 237' South and 3582' East, a drift was driven 70' easterly to the eastern end of the ore. From a mill, 277' South and 3470' East, a drift was driven 18' southwesterly to the western limit of the ore and 32' northeasterly. Also from this Sub two cribbed mills and one double compartment raise was put up to the 390' Sub.

350' Sub-Level

From a rise 237' South and 3582' East, a drift was driven 135' southwesterly to the western limits of the ore. Four cribbed mills and one double compartment raise were put up to the 370' Sub.

300' Sub-Level

Last year's drifts on this sub-level, were advanced. The one to the northeast was advanced 75' east, the one southeasterly 50' and the drift southwesterly advanced 128'. One cribbed mill and one double compartment raise were put up to the 350' Sub.

200' Sub-Level

On this Sub the Northeast-Southwest development drift was advanced 72' to the northeast and 100' to the southwest, holing to a raise at 335' south and 3403' East.

135' Sub-Level

On this Sub, two slushing or loading subs were put in. These consisted of 73' of drifting for one and 50' for the other.

Sixth Level

From a raise 20' South and 3530' East, put up from the 90' Sub, a drift was driven 15' East in dike holing to the main haulage drift.

From a point 235' South and 3557' East a double compartment raise was put up 20' to the slushing or loading sub.

From a raise 323' South and 3323' East a drift was driven 12' easterly holing to the main south haulage drift.

The South main haulage drift was advanced 60' to the southwest in jasper and from the end of this drift a dog drift was driven 27' southerly to the south dike. This also was in jasper.

At a point 320' South and 3280' East a raise was put up 60' in lean ore and jasper expecting to encounter ore shown in D. D. Hole No. 132.

90' Sub-Level

On this Sub, two new scraping drifts were put in and two advanced. One of the new drifts was from a point 22' South and 3305' East to a point 18' South and 3528' East. At the eastern end of this drift a double compartment raise was put up to the elevation of the 6th Level. The other new one was a North-South drift from a point 153' South and 3176' East to the North property line. One of the advanced drifts was an East-West drift which was extended 83' West from a point 152' South and 3070' East. The other one was advanced 110' North to the boundary line from a point 113' South and 3294' East. The first 70' of the latter drift was in jasper.

A North-South development drift was extended 82' South from a point 245' South and 3323' East. The last 38' of this drift was in ore, the remainder being in jasper. At a point 8' back from the breast, a raise was put up to the elevation of the 6th Level. This drift and raise is being used as a traveling road.

70' Sub-Level

One new scraping drift was put in, two advanced and another new drift started. The new drift extends from a point 30' South and 3328' East to a point 30' South and 3515' East. From this drift five cribbed mills were put up to the 90' Sub. One of the advanced drifts was extended on both ends, 160' easterly from a point 174' South and 3298' East and westerly 75' from a point 164' South and 3114' East. Four cribbed mills were put up from this drift to the 90' Sub. The other advanced drift is in the East end of the orebody and was extended 115' East from a point 150' South and 3714' East. Eight cribbed raises were put up tp the 90' Sub from this scraping drift. The new drift extends 42' North from a point 159' South and 3420' East.

50' Sub-Level

Two scraping drifts were put in at this elevation, one in the east end of the ore body and the other in the west end. The East drift extends from a point 160' South and 3560' East to a point 160' South and 3813' East. Three cribbed mills were put up to the 70' Sub. The West drift extends from a point 185' South and 3325' East to a point 177' South and 3098' East. Two cribbed mills were put up from this drift to the 70' Sub.

25' Sub-Level

On this Sub, two old scraping drifts were connected, two new drifts put in and another advanced. The new North-South drift extends from a point 190' South and 3349' East to a point 30' South and 3349' East. The north 57' of this drift is in footwall material. From a point 18' back from the breast a double compartment raise was put up to the 90' Sub. The other new drift extends from a point 321' South and 3015' East to a point 321' South and 2795' East. All except the last five feet of this drift is in high grade ore. The drift that advanced was extended 112' to the northwest from a point 245' South and 2950' East. The last 50' of this drift was in jasper and from the end of this drift a small dog drift was driven 20' northerly crossing a 6' dike. One cribbed mill was put up from this Sub to the 70' Sub.

-80' Sub-Level

Two loading or slushing drifts were put in on this Sub. One drift connects the two most westerly raises and the other driven 45' north from a raise that is 280' South and 3182' East. From a point 8' back from the breast of this drift a raise was put up to the 70' Sub, holing to the 50' Sub on the way up.

Seventh Level

Three raises were put up from the 7th Level, two being only 20' high for slushing and loading. The other raise which started from a point 40' South and 3350' East was put up and holed to the 25' Sub.

c. Stoping

Main Deposit

All ore on the 6th Level and above, has been mined with the exception of the South riser and a small pillar, near the boundary line, which must be kept intact to support the main haulage drift serving to mine the South riser. In the mining of the ore on the 6th Level, by the Gogebic System, pillars standing on the 120' Sub were caved and extracted.

There are five gangs stoping in the +90' Sub which is approximately 25' below the 6th Level. At this elevation the central riser has joined the Main Deposit and from present indications it looks as though the ore in the extreme east end will also connect with the main area at this elevation. The ore in the east end on the 90' Sub has been mined as far West as it was advisable so as to maintain the 6th Level main haulage drift.

There are four gangs stoping on the +70' Sub which is about 45' below the 6th Level. Two of these gangs are stoping in the extreme east end of the deposit, one just starting in the west end and the other in the center.

Main Deposit (East Riser)

The mining of the upper two Subs has been completed and at the present time there are three gangs stoping on the third or +370' Sub.

The top, (+435') Sub was mined to a height of +455' on the North end and +468' on the South end. This mining was all done by open stoping as the areas were very small.

The second or 390' Sub was mined by both open stoping and Gogebic slicing. The interval between this and the upper Sub was 45', therefore, it was necessary to put up several dog raises and drive several dog drifts to reach the higher portions of the ore. The area of ore increased from about 1800 square feet on the top Sub to 12,000 square feet on this Sub.

West Deposit

The mining of the ore on and above the 6th Level in this deposit has been completed and no more mining can be done here until it is developed from the 7th Level.

9. EXPLORATIONS

The following is a log of holes drilled during the year, showing the location, dip, course, total length, ore footage and analysis of same in dried iron and phosphorus:

No.	Level	Location	Dip	Course	Length	Ore Footage and Analysis	Iron	Phos.
133	6th Level	S 186' E 2977	+5°	Due South	268'	105-120	59.24	.079
						215-255	57.41	.068
134	390' Sub	S 212' E 3487	0°	N 7° W	104'	0'-5'	62.64	.042
						10'-50'	60.59	.038
135	390' Sub	S 230' E 3560	0°	S 10° E	34'	0'-10'	58.36	.060
136	390' Sub	S 279' E 3518	0°	N 82° W	78'	None		
137	390' Sub	S 282' E 3528	0°	S 81° E	142'	5'-20'	58.63	.053
						25'-70'	59.16	.064
138	390' Sub	S 285' E 3520	0°	S 45° W	141'	5'-30'	59.22	.079
139	390' Sub	S 270' E 3535	0°	N 45° E	106'	17'-50'	64.00	.039
						80'-100'	58.68	.038
140	300' Sub	S 297' E 3536	0°	Due South	83'	5'-10'	64.55	.025
						22'-30'	58.32	.043
						35'-60'	64.62	.045
141	300' Sub	S 255' E 3470'	0°	Due North	95'	0'-20'	63.14	.052
						35'-50'	59.92	.033
						55'-80'	63.18	.038
142	300' Sub	S 284' E 3429	0°	S 40° E	111'	0'-38'	62.14	.089
143	300' Sub	S 230' E 3520	0°	N 25° E	80'	0'-24'	65.97	.021
						45'-69'	64.22	.032
144	200' Sub	S 230' E 3510	0°	Due North	55'	None		
145	200' Sub	S 283' E 3505	0°	Due South	55'	0'-6'	62.00	.043
						20'-50'	60.29	.042
146	6th Level	S 241' E 3630	0°	S 60° E	91'	40'-45'	58.44	.090
147	6th Level	S 243' E 3622	0°	S 32° W	80'	None		
148	50' Sub	S 176' E 3098	0°	N 84° W	52'	None		
149	25' Sub	S 179' E 3570'	0°	S 18° E	139'	5'-48'	65.36	.100
						55'-81'	63.12	.126
						92'-130'	60.51	.094
150	25' Sub	S 322' E 2794	0°	Due West	290'	None		
151	25' Sub	S 318' E 2794	+5°	N 44° W	145'	10'-20'	60.90	.070

Being continued.

John Trosvig
Engineer

JT:ELC

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1. GENERAL:

The fences around the open pits and old shafts were inspected during the summer and repairs made where needed.

10. TAXES:

	1942		1941	
	Valuation	Taxes	Valuation	Taxes
Various Parcels	$ 29,600	$ 967.24	$ 29,600	$ 982.98
Collection Fees		9.67		9.83
Total	$ 29,600	$ 976.91	$ 29,600	$ 992.81
City of Negaunee Tax Rate Per $100.00 Valuation		$ 3.267		$ 3.321

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1. GENERAL

The regular operating schedule for the Maas Mine for the year 1942 was three shifts for five days per week and two shifts on Saturday, with only repairing and cleaning up on Sunday. This schedule was broken, however, from March 24th to April 8th when the North skip rope broke, allowing the loaded skip to fall 350 feet from the shaft collar, breaking through from the skip compartment into the cage compartment, and either tearing out or bending all the steel dividers for the entire distance. This accident is explained in detail under the caption "Skips & Cages". In order that the men could make up some of this lost time and also produce additional tonnage to partly offset the loss of approximately 36,500 tons, the mine operated on the third shift on Sundays from May 9th to June 6th inclusive.

In spite of the delay mentioned above, the total product for the year exceeded that for any former year by 55,000 tons, there being 882,399 tons hoisted. The best monthly product occurred in May when there was hoisted 86,038 tons, the highest previous hoist being 80,930 tons in October, 1941. The shipments for the year, however, were not as large as that for 1940 on account of shipping until such a late date in both 1940 and 1941 and therefore having less in stock to start with. There were 30,789 tons of previous year's overrun and 27,599 tons of current year's overrun shipped from stockpile during 1942, making a total of all grades, both stockpile and pocket of 913,188 tons. The steel stocking trestle was almost empty on December 1st, there having been only a small amount of wet ore stocked during November. The Southeast and the West wooden trestles had only approximately 9,000 tons of Special grade, while the Southwest wooden trestle was entirely empty at the end of the shipping season.

One of the most difficult problems during the year has been the breaking in of new men, particularly in the actual mining operations, as between the draft, transfers to the Princeton Mine, and quitting there was a decrease of 40 experienced miners in 1942. The effect of these new men on the product was very noticeable toward the latter part of the year when most of the changes occurred, and although quite a number of those first put in the contracts are now able to produce a normal amount, it will still take several months before production can reach the peak of last summer. There is also the question of getting these new men deferred, as the draft board does not consider them exempt without a year's experience. Therefore their training will be wasted, and it will be necessary to repeat with other new men, who in turn may be taken. The number of men quitting for better paying jobs in the factories has noticeably fallen off in the fall months, and it is hoped that this is an indication that the remainder will stay on their jobs. If the turnover is anywhere near as large in 1943 as it was this year, it will be impossible to maintain the fine record of production which was made in 1942. Having to employ so many new men also introduces considerable hazard from a safety standpoint and takes the time of the foremen, as they require so much more supervision.

Mining was continued in the same general areas which were worked last year,namely the East footwall pillar above the 3rd Level, the West footwall pillar above and below the 3rd Level, the second and third

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1. GENERAL (Cont.)

blocks East of the Race Course lease above the 4th Level, the first block East of the Race Course lease on and below the 4th Level, and the main area just above the 5th Level in both the Maas and Race Course leases. Exploration and development were started in the North footwall area above the 5th Level and by the end of the year an additional area about 240' x 30' had been outlined on the 100' Sub Level and extending to 40' above the 4th Level at one place so far tested. The ore here is of standard grade and will probably increase in size as mining descends. The East footwall drift on the 4th Level, started last year, was continued and also a second cross-cut turned off to the South, anticipating the need of more raises to take the places of those from the 3rd Level in the East footwall pillar where mining has about reached the level and also to make room for contracts that will have to be moved from the 5th Level area until such a time as the 6th Level is developed. At the end of the year almost one-half of the gangs working above the 5th Level had reached the lowest sub it will be possible to work from this level.

Exploration work from the 5800 or Westerly Cross-cut on the 5th Level has proved that the ore between this and the 5700 Cross-cut does not extend very far above the level, but it may be necessary to do some work here during 1943 to keep all of the contracts occupied until some of the 6th Level raises are completed.

The auxiliary winze from the 5th Level was completed and by the end of the year there was 205' of drifting completed on the 6th Level 104' below. A crew working only part time in the main shaft had also enlarged the 6th Level plat and extended the shaft 86' below the level for skip pit and pocket. It is expected that all of this preliminary work will be completed early in 1943 and then drifting will start on the 6th Level toward the auxiliary winze.

When all of the Bessemer ore in stock was shipped, it was decided to discontinue the grading of any more Bessemer at the Maas Mine, as practically all of the Bessemer areas are now contaminated with sulphur and in the remaining areas the phosphorus content is so irregular that, with only two or three contracts at a time who might produce this grade, it is impracticable to try and grade out the low phos. ore. If, however, any new area opens up that runs 50% or better in low phos. content, an attempt will again be made to grade Bessemer.

There was no further new work done during the year in connection with the recovering of water on surface before entering the mine. All of the wells put down so far have proved disappointing except Nos. 1 and 2, and none of the more recent test drilling has shown any favorable location for another well. There was no further decrease in the amount of water pumped underground in 1942, but it still remains about 200 gallons per minute less than in former years. However, most of the decrease was effected on the footwall, where it is much easier to handle the water and therefore there has not been very much help in actual mining operations.

There were no new projects on surface during the year, and the only work of an extraordinary nature was that of putting up a small amount of fencing and screening doors and windows on the engine house to guard against possible sabotage.

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2. PRODUCTION, SHIPMENTS & INVENTORIES

a. Production by Grades

	1942	1941	Increase	Decrease
Maas Bessemer	7,756*	25,241**		17,485
Race Course Bessemer	752*	9,338**		8,586
Maas	623,737*	561,478**	62,259	
Race Course	114,019*	116,660**		2,641
Maas Special	38,868*	48,633		9,765
Race Course Special	128,056*	93,687	34,369	
Total	913,188	855,037	58,151	
Rock	39,245	29,225	10,020	
Total Hoist	952,433	884,262	68,171	

*Includes current and previous year's stockpile overrun of 58,388 tons.

**Includes current and previous year's stockpile overrun of 34,304 tons.

b. Shipments

Grade of Ore	Pocket Tons	Stockpile Tons	Total Tons	Total Last Year
Maas Bessemer	2,023	10,557	12,580	46,661
Race Course Bessemer	0	770	770	9,546
Maas	359,130	247,520	606,650	567,124
Race Course	59,701	52,275	111,976	114,570
Maas Special	15,003	26,122	41,125	43,398
Race Course Special	51,474	77,123	128,597	96,508
Total	487,331	414,367	901,698	877,807
Total Last Year	421,716	456,091	877,807	
Increase	65,615		23,891	
Decrease		41,724		

There were 91,054 tons shipped all rail, of which 67,532 tons were Special grade to Koppers Manufacturing Company at Granite City, Illinois, and the balance to charcoal furnaces in the U. P.

c. Stockpile Inventories

Grade of Ore	12-31-42	12-31-41	Increase	Decrease
Maas Bessemer	0	4,824		4,824
Race Course Bessemer	0	18		18
Maas	50,221	33,134	17,087	
Race Course	14,087	12,044	2,043	
Maas Special	8,147	10,404		2,257
Race Course Special	17,233	17,774		541
Total	89,688	78,198	11,490	

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d. Division of Product by Levels

	1942	%	1941	%
Third Level	271,647	30.8	269,245	32.6
Fourth Level	184,052	20.8	179,893	21.8
Fifth Level	426,700	48.4	378,231	45.6
Total	882,399	100.0	827,369	100.0

e. Production by Months

Month	Maas Bess.	Maas	Maas Spcl.	R. C. Bess.	Race Course	R. C. Spcl.	Total	Rock
January	3,174	39,409	6,667	450	12,310	10,758	72,768	2,505
February	4,044	46,208	2,417	481	9,379	8,820	71,349	2,370
March	594	37,815	1,756		6,979	9,955	57,099	2,185
April	1,039	40,869	85	51	10,605	9,486	62,135	1,135
May	932	60,581	483		9,065	14,977	86,038	2,305
June	4,704	50,496	2,441		8,004	14,008	79,653	2,275
July		50,016	5,392		7,544	11,353	74,305	3,640
August		52,245	6,387		7,617	9,840	76,089	3,750
September		48,731	3,098		6,924	13,313	72,066	5,520
October		51,858	2,639		9,483	11,831	75,811	3,740
November		48,589	1,152		9,831	6,637	66,209	3,540
December		39,753	5,216		11,966	4,343	61,278	6,280
Total	14,487	566,570	37,733	982	109,707	125,321	854,800	39,245
1942 Stock-pile O'run	112	19,535	1,135	177	3,681	2,959	27,599	
Prev. Yrs. Overrun		30,789					30,789	
Gr. Total	14,599	616,894	38,868	1,159	113,388	128,280	913,188	39,245

The product was distributed as follows:

	1942	1941	Increase	Decrease
George Maas Lease	584,259	541,417	42,842	
Catholic Cemetery	53,062	60,200		7,138
American Mining Co.	5,388	5,081	307	
C. C. I. Co. (Right of Way)	12,134	10,268	1,866	
Race Course	242,827	219,685	23,142	
City of Negaunee	15,518	18,386		2,868
Total	913,188*	855,037**	68,157	10,006
Total Increase			58,151	

*Includes current and previous year's stockpile overrun of 58,388 tons.
**Includes current and previous year's stockpile overrun of 34,304 tons.

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f. Ore Statement

	Maas Bess.	Maas	R. C. Bess.	Race Course	Maas Spcl.	R. C. Spcl.	Total	Total Last Year
On Hand 1-1-42	4,824	33,134	18	12,044	10,404	17,774	78,189	100,968
Product for Year	14,487	566,570	982	109,707	37,733	125,321	854,800	820,733
Trans. to & from	6,843	6,843	407	631		224		
Cur. Yrs. O'run	112	19,535	177	3,681	1,135	2,959	27,559	6,636
Prev. Yrs. O'run		30,789					30,789	27,668
Total	12,580	656,871	770	126,063	49,272	145,830	991,386	965,005
Shipments	12,580	606,650	770	111,976	41,125	128,597	901,698	877,807
Balance on Hand		50,221		14,087	8,147	17,233	89,688	78,198
Increase in Output							58,151	
Increase in Ore on Hand							11,490	

Estimated stockpile overrun still in stock at end of 1942 shipping season:

Maas	2,000
Race Course	0
Maas Special	0
Race Course Special	0
Total	2,000

1942 3 8-hour shifts, 5 days per week and 2 8-hour shifts on Saturday from January 1st to March 24th. Mine idle March 24th to April 8th. 3 8-hour shifts 5 days per week, 2 8-hour shifts on Saturday April 8 to May 9th; one extra shift on Sunday night was added from May 9th to June 6th. From June 6th to December 31st, 3 8-hour shifts 5 days per week, 2 8-hour shifts on Saturday. A smaller crew on 3rd shift all year on account of not working wet places on that shift.

1941 3 8-hour shifts, 5 days per week from January 1st to January 25th; two-thirds of the regular mining crews were on the third shift. From January 25th to September 1st there was one additional 8-hour shift worked on Saturday, and from September 1st to December 31st there were two 8-hour shifts on Saturday, or 17 shifts per week.

1940 2 8-hour shifts, 5 days per week with a small hoisting crew on the third 8-hour shift from January 1st to September 1st, and after that an increasing number of miners on the third shift until, at the end of the year, there were 16 contracts on three shifts. The men on each crew alternated as to day, afternoon and midnight shifts.

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f. Ore Statement (Cont.)

1939 1 8-hour shift, 4 days per week, and 2 8-hour shifts, 1 day per week, with a small hoisting shift 3 8-hr. shifts per week with crews alternating to receive 3 days per week, January 1st to January 9th.

2 8-hour shifts, 4 days per week, and a small hoisting third shift with crews alternating to receive 4 days per week, January 9th to June 12th.

1 8-hour shift, 4 days per week, and 2 8-hour shifts one day per week, with a small hoisting shift 3 8-hour shifts per week with crews alternating to receive 3 days per week, June 12th to September 11th.

2 8-hour shifts, 5 days per week, and a small hoisting third shift with crews alternating to receive 5 days per week, September 11th to December 31st.

1938 2 8-hour shifts, 6 days per week January 1st to April 16th, with 3 crews alternating to average 4 days per week; April 16th to June 1st, 5 days per week with 3 crews alternating to average 3 days per week.

1 8-hour shift, 4 days per week, June 1st to November 1st, with 2 crews alternating each week to average 2 days per week. November 1st to December 31st, 5 days per week with 2 crews staggered to average 3 days per week. In last two schedules there was also a small hoisting crew on a second 8-hour shift.

g. Delays

Electrical

Date	Shift	Duration	Loss In Product	Cause
Apr. 29th	Night	½ Hr.	80 Tons	No Power
July 18th	Aft.	3 Hrs.	400 Tons	No Power
Aug. 21st	Night	1 Hr.	150 Tons	No Power
Sept. 9th	Night	1½ Hrs.	200 Tons	Electrical Difficulty with larry car system.
Sept. 28th	Day	1½ Hrs.	200 Tons	Leak in solution tank on hoist set.
Nov. 6th	Day	1½ Hrs.	200 Tons	Repairing switchboard in engine house.
Nov. 13th	Aft.	½ Hr.	50 Tons	Repairing switchboard in engine house.

Non-Electrical

Jan. 9th	Day	½ Hr.	80 Tons	Repairing skip hoist sheave on shaft house.
Mar. 10th	Day	2½ Hrs.	350 Tons	Broken skip runner in shaft.
Mar. 24th to Mar. 31st			19,000 Tons	North skip rope broke, dropping
Apr. 1st to Apr. 8th			17,500 Tons	loaded skip 350' from collar and wrecking shaft.
Apr. 8th	Day	3 Hrs.	200 Tons	Broken stringer in dump.
July 9th	Day	1½ Hrs.	200 Tons	Broken shaft runner.

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g. Delays (Cont.)
Non-Electrical

Date	Shift	Duration	Loss In Product	Cause
July 20th	Day.	1 Hr.	150 Tons	Repairing in Shaft
July 16th	Aft.	3 Hrs.	400 Tons	Repairing skip bearing and skip road.
Aug. 17th	Day	1½ Hrs.	200 Tons	Repairing broken main air line at shaft collar.
Oct. 6th	Day	½ Hr.	100 Tons	Replacing rollers in dump.
Oct. 10th	Day	1¼ Hrs.	200 Tons	Removing chunks from 4th level pocket.
Oct. 12th	Day	1 Hr.	125 Tons	Removing chunks from 4th Level pocket.
Nov. 25th	Aft.	1½ Hrs.	150 Tons	Repairing air line at shaft collar.
Dec. 29th	Aft.	1 Hr.	125 Tons	Repairing sheave wheel in skip road.

3. ANALYSIS

a. Average Mine Analysis on Output

Grade	1942 Iron	Phos.	Sil.	Sul.	1941 Iron	Phos.	Sil.	Sul.
Maas Bessemer	60.05	.058	7.51	.021	61.70	.053	6.48	.018
Maas	60.14	.093	8.32	.020	60.12	.088	8.30	.019
Race Course Bess.	62.21	.052	6.05	.019	61.77	.049	7.54	.018
Race Course	60.21	.089	8.27	.025	60.09	.086	8.39	.020
Maas Special	60.60	.074	7.44	.140	60.90	.088	7.61	.116
Race Course Special	60.70	.080	7.40	.151	61.06	.077	7.07	.129

b. Average Mine Analysis on Ore Shipped

Grade	Iron	Phos.	Sil.	Alum.	Mang.	Lime	Mag.	Sul.	Loss	Moist.
Maas & R. C. Bess.	61.40	.044	7.20	2.63	.21	.30	.12	.022	1.42	11.75
Maas & R. C. Non-Bess.	60.15	.092	8.37	2.62	.21	.53	.22	.019	1.57	12.00
Maas & R. C. Special	60.90	.081	7.23	2.55	.21	.60	.18	.171	1.47	12.00

d. Average Analysis of Ore in Stock - December 31, 1942

Average Natural Analysis

Grade	Tons	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moist.
Maas	50,221	52.57	.082	8.31	.195	2.09	.505	.160	.019	1.32	11.30
Maas Special	8,147	51.68	.055	7.09	.183	2.01	.523	.157	.098	1.40	12.80
Race Course	14,087	51.91	.075	8.40	.184	2.13	.412	.149	.031	1.33	12.40
Race Course Spl.	17,233	52.54	.067	7.55	.184	2.30	.411	.236	.114	1.75	12.50

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4. ESTIMATE OF ORE RESERVES

a. Developed Ore

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

Location	Race Course Lease	Maas Lease	R.C.Cem Lease	B.K. Road City of Neg. Lease	C.C.I.Co. Strip	Total Tons
Above 3rd Level		312,141	37,791	596	5,104	355,632
3rd to 4th Levels	171,943	1,898,280	5,833	8,594	7,010	2,091,660
4th to 5th Levels	237,681	741,610		22,660	1,125	1,003,076
Gross Total 11-30-42	409,624	2,952,031	43,624	31,850	13,239	3,450,368
Less 10% Mining Loss	40,962	295,203	4,362	3,185	1,324	345,036
Balance	368,662	2,656,828	39,262	28,665	11,915	3,105,332
Less 10% for Rock	36,866	265,683	3,926	2,866	1,192	310,533
Balance	331,796	2,391,145	35,336	25,799	10,723	2,794,799
Less Dec. 1942 Prod.	11,966	35,448	2,450	266	1,589	51,719
Total Standard Grade	319,830	2,355,697	32,886	25,533	9,134	2,743,080
Total Special Grade	570,392	549,758		28,674		1,148,824
Grand Total 12-31-42	890,222	2,905,455	32,886	54,207	9,134	3,891,904
N1/6 D.S.S.& A. Right of Way (Adams Strip)						7,318
Total Maas Group to be mined through Maas shaft.						3,899,222

1,118,771 tons in the Maas area as of December 31, 1942, is leased to the Negaunee Mine, of which 47,790 tons is special grade.

INCREASE IN ORE RESERVES

	Maas etc.	Race Course	Total
Above 3rd Level	60,000	1,000	59,000
3rd to 4th Levels	100,000	9,000	91,000
4th to 5th Levels	225,000	120,000	345,000
	385,000	110,000	495,000

Divided as to grades:

Maas		Race Course	
Standard	Special	Standard	Special
240,000	145,000	40,000	70,000

In comparison with 1941, this year's estimate of ore reserves as reported to the tax commission shows an increase of 280,000 tons of standard ore and 215,000 tons of special ore after subtracting 1942 production.

The increase of 60,000 tons above the 3rd Level was due to the continued flattening of the hanging in the Southwest portion of the Northeast footwall pillar. The increase of 91,000 tons between the 3rd and 4th Levels is due to the footwall being of a steeper dip than had been originally estimated and proved this year by raises put up from the North footwall drift on the 4th Level. The increase between the 4th and 5th Levels in the standard grade was due to the

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a. Developed Ore (Cont.)

proving up of the ore to the North of the main dike and to the West of any previous mining. This affected the Maas lease more than the Race Course, but there was some additional tonnage proved to the South of Raises #5019 and #5020, also in the Race Course lease.

The increase in the amount of special ore remaining between the 4th and 5th Levels was due to the ore found to the West by drilling on the 25' Sub and also to a flattening of the footwall on the 40' Sub to the South of the Race Course lease. The increase in area on the 65' Sub as mentioned above at #5019 Raise also increased the special ore as everything below the 65' Sub to the 5th Level is estimated to contain high sulphur.

c. Estimated Reserve Analysis

Natural Grade	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moist.
Maas & Race Course Non-Bessemer	53.00	.082	7.20	.190	2.20	.800	.240	.018	1.70	12.00
Maas & Race Course Special	53.40	.070	6.60	.190	2.10	.750	.220	.200	1.80	11.75

d. Estimated Production
December 1st, 1942, to December 1st, 1943

Grade	Estimated Production 17 Shifts per Week Dec. 1, to Feb. 1 16 Shifts per Week Feb. 1, to Dec. 1
Maas & Race Course Non Bessemer	643,000 Tons
Maas & Race Course Special	180,000
Total	823,000 Tons
Plus 4% overrun on ore Stocked	14,000
Grand Total	837,000 Tons

Grade	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moist	Iron Nat'l.
Maas & Race Course Non-Bessemer	60.50	.093	8.30	.22	2.40	.85	.25	.020	1.80	12.00	53.00
Maas & Race Course Special	61.00	.080	7.50	.22	2.40	.85	.25	.250	1.80	12.00	53.40

5. LABOR & WAGES

a. Comments

1. Labor

The changes in the personnell of the Maas Mine employees continued to show an increase, as is evidenced by the table below. This was occasioned partly by the large number of men drafted into or

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1. Labor (Cont.)

enlisting in the U. S. Armed Forces, but still further by the inducement of high wages in other industries, causing 42 men to leave during the year. At the present time there are very few men available for underground work, none of whom have had any experience, and this, together with the fact that of the 123 men hired this year 30% were below 20 years of age, and who are very liable to be drafted next year under the new set-up, makes a very grave situation with regard to maintaining a large production. Altogether there were 40 experienced miners lost during the year and most of these younger men are in training to take their places. The record of changes during the year is as follows:

	1942	1941	1940
Died	1	7	4
Fatal Accident at Mine	0	1	0
Retired at age of 65 or over	6	1	6
Unable to work on account of ill health	1	0	5
Transferred to other C. C. I. Co. properties	22	14	4
In armed services of U. S.	35	17	2
Quit to go to school or other occupations	42	8	5
Total	107	48	26
Hired or Transferred to the Maas	123	79	80

The average age of the employees in 1942 was 38, as compared to 40 in 1941, and 34 employees were 60 or over. Three of the men had served 40 years or over in the Company's employ and 64 over 25 years.

The men received their vacation checks on a slightly different basis this year, that is, those who had worked ten years or more for the company received 92 hours pay, and those who had worked from three to ten years received 46 hours' pay. Due to the war there were no vacations given except to the bosses, and the men received their checks in August.

218 men, or 41% of the payroll, received pay for 92 hours.
148 men, or 28% of the payroll, received pay for 46 hours.

The safety bonus for the bosses was on the same basis as during last year, and there was no additional bonus for the men. There was, however, a suggestion contest under the caption "More Ore to Win the War" and $350.00 was distributed, covering eight prizes and Maas Mine employees won three of them, consisting of 5th, 6th, and 7th.

The men also received checks for overtime worked from October 24th, 1938, to April 16th, 1941, before the eight hours collar to collar rule was put into force. It had been decided that this rule was retroactive to October 24th, 1938, and therefore a large number of office men were employed almost a year calculating this back pay. The total amount paid out to Maas Mine employees was $7,701.39 and averaged approximately $17.00 per man eligible.

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1. Labor (Cont.)

There were no changes in wages or working schedules during the year except the government ruling that men working on holidays designated were to receive time and one-half pay while work on the 7th consecutive day of the scheduled work week was to have double compensation. When work of this nature could be anticipated, the men's time was staggered so as to avoid as much of this overtime as possible.

2. New Construction

There were expenditures on the following E & A only during 1942:

E & A No. CC-78 Development of 6th Level

This E & A will be taken up in detail under No. 12 - "New Construction".

b. Comparative Statement of Wages & Product

	1942	1941	Increase	Decrease
Product	882,399	827,369	55,030	
Number of Shifts & Hours	296	304		8
1 8-hour	7	26		19
2 8-hour	47	21	26	
3 8-hour	242	257		15
AVERAGE NO. MEN WORKING				
Surface	75	77		2
Underground	423	416	7	
Total	498	493	5	
AVERAGE WAGES PER DAY				
Surface	6.74	6.54	.20	
Underground	7.72	7.30	.42	
Total	7.56	7.19	.37	
AVERAGE WAGES PER MONTH				
6.00 Days per week 1941				
6.00 Days per week 1942				
Surface	155.02	150.45	4.57	
Underground	177.56	171.73	5.83	
Total	173.88	168.41	5.47	
PRODUCT PER MAN PER DAY				
Surface	39.32	38.94	.38	
Underground	7.43	7.05	.38	
Total	6.25	5.97	.28	
LABOR COST PER TON				
Surface	.172	.168	.004	
Underground	1.039	1.036	.003	
Total	1.211	1.204	.007	

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b. Comparative Statement of Wages & Product (Cont.)

	1942	1941	Increase	Decrease
AVERAGE PRODUCT MINING				
Stoping	18.68	17.53	1.15	
Ore Development	7.55	9.10		1.55
Total	18.45	17.15	1.30	
AVERAGE WAGES CONTRACT LABOR	7.369	7.556		.187
TOTAL NUMBER OF DAYS				
Surface	22,444¼	21,245¼	1,199	
Underground	118,801¼	117,383¼	1,418	
Total	141,245½	138,628½	2,617	
AMOUNT FOR LABOR				
Surface	151,382.48	139,016.69	12,365.79	
Underground	916,777.78	857,285.10	59,492.68	
Total	1,068,160.26	996,301.79	71,858.47	
AVERAGE WAGES PER MONTH BASED ON MEN CARRIED ON MINE PAYROLL				
Surface	168.17	150.25	17.92	
Underground	180.58	171.38	9.20	
Total	178.75	168.24	10.51	

Proportion of Surface to Underground Men

1942 - 1 to 5.7 3 regular 8-hour shifts 5 days per week and 2 regular 8-hour shifts on Saturday from January 1st to December 31st, except from March 24th to April 8th when the mine was idle, and from May 9th to June 6th, when there was one extra shift on Sunday night.

1941 - 1 to 5.4 3 regular 8-hour shifts, 5 days per week and one extra 8-hour shift on Saturday from January 25th to September 1st; two extra 8-hour shifts on Saturday from September 1st to December 31st. The night shift is somewhat smaller than the other two, due to having no miners in the wet contracts.

1940 - 1 to 5.0 2 regular 8-hour shifts and a small third 8-hour shift with an increasing number of men employed as miners on this shift as the year progressed, all alternating to receive 5 days per week from January 1st to December 31st.

1939 - 1 to 5.1 1 8-hour shift, 4 days per week, and 2 8-hour shifts 1 day per week, with a small hoisting shift 3 8-hour shifts per week with crews alternating to receive 3 days per week, January 1st to January 9th. 2 8-hour shifts, 4 days per week, and a small hoisting third shift with crews alternating to receive 4 days per week, January 9th to June 12th. 1 8-hour shift 4 days per week, and 2 8-hour shifts one day

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b. Comparative Statement of Wages & Product (Cont.)

per week, with a small hoisting shift 3 8-hour shifts per week, with crews alternating to receive 3 days per week, June 12th to September 11th. 2 8-hour shifts 5 days per week, and a small hoisting third shift with crews alternating to receive 5 days per week, September 11th to December 31st.

1938 - 1 to 4.4 2 8-hour shifts 6 days per week, from January 1st to April 16th, with a third 8-hour shift composed of a tramming and hoisting crew and approximately 16 mining contracts. April 16th to June 1st, the time was decreased to two days per week with the same crews. On June 1st the third shift mining crew was laid off and until November 1st operated 1 8-hour shift 4 days per week with a very small haulage crew on the second shift, the two crews alternating each week so that the men received only 2 days per week average. November 1st to December 31st, 1 8-hour shift 4 days per week and 2 8-hour shifts 1 day per week with staggered crews receiving 3 days per week.

6. SURFACE

a. Buildings and Repairs

The painting of the interior of the dry was finished early in the year, thus completing the E & A authorized for the remodeling of the underground and surface drys. The new arrangement has worked out very satisfactorily with the exception of the heating of the water for the showers and it was not until there had been four tanks of 500 gallons capacity each that there was sufficient hot water for the largest shift composed of some 250 men. The necessity for this large amount of storage was on account of using the surface well water which is much colder than the city supply and therefore required more hot water to mix with the cold. The use of the well water constitutes a saving of approximately $100.00 per month over having to buy water from the city.

The shaft house and the permanent approach to the trestles was given a protective coat of red oxide paint during the year, thus increasing the life of the steel members.

New roofs were installed on the engine house and on the office, that on the former being an insulated three-ply roof put on by H. H. Pellow & Sons under contract, while the latter was three-tab hex gypsum shingles put on by our company carpenters. There were also the small customary repairs to the remaining buildings to keep them in good shape, and part of the old coal dock was dismantled, leaving only 15 open bents for the storage of coal entirely separated from the covered part at the North end. This latter part is in very bad

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a. Buildings and Repairs (Cont.)

shape and will be dismantled next year as it is no longer needed for storage of equipment, now that the old boiler house is available for that purpose.

b. Location Buildings and Repairs

There was only a small crew of carpenters and painters employed on repairs to rented houses until late in the fall when it was decided to redecorate two houses throughout for the new doctor and the research engineer and also repair and paint the American Legion Building. To complete the work in time it was necessary to increase the force considerably, but by the end of the year most of these extra men had been either laid off or transferred back to the Ishpeming District. With the selling of the houses in the first and second additions, there is not near so much work of this nature and only a very small force should be required in 1943.

Three houses were sold during the year and none were purchased. Those sold during the year and those remaining on December 31st are listed as follows:

House No.	Address	Lot	Block	Addition	Purchaser	Date
33	957 Pine Street	4& S 20'3	4	2nd	John D. Rule	3-1-42
43	973 Baldwin Road	1	2	2nd	Clarence Brisson	3-1-42
190*	305½ Peck St.	2	33	Pioneer Iron Co. Plat	Thomas Anderson	1-1-42

*This house was a small building in the rear of the lot, in very bad shape and sold to be dismantled.

Houses Belonging to Maas Mine 12-31-42

Single Family Houses	51
Two " "	4
Three " "	0
Four " "	1
Legion Club	1
Store	1
Church	1
Total	59

c. Stockpiles

An almost total clean-up of all the ore in stock was made several times during the year, as the bulk of the ore was shipped out early in the season and as the wet ore, which amounts to approximately 30%, dried out it was also cleaned up with the assistance of a bull dozer and also shipped. The Southeast and Southwest wooden trestles were dismantled, but the main West trestle was kept intact and the ore removed by the shovel without breaking more than two

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c. Stockpiles

legs. As it is not possible to make any more Bessemer grade, there is more than ample stocking room for both Maas and Special grades during the winter season, and as there are two independent trestles for each grade, it will also be possible to stock the wet ore while shipping next year. All of the ore remaining in small ridges on the sollar where ore had formerly been stocked was cleaned up with the bull dozer, thus adding to the previous year's overrun. All of the wooden trestles have been re-erected and are in readiness for stocking. There were no additional bents added to the rock trestle, as it is possible with the use of the bull-dozer to scrape the rock for some 10' below the top of the trestle, thus widening the pile and leaving space for future dumping.

The following stockpile overruns were developed during the year:

	Maas Bess.	Maas	Maas Spcl.	R. C. Bess.	Race Course	R. C. Spcl.	Total
Previous Year Overrun	0	30,789	0	0	0		30,789
Current Year Overrun	112	19,535	1,135	177	3,681	2,959	27,559
Estimated Overrun in Stock December 31st, 1942	0	2,000	300	0	500	700	3,500
Total	112	52,324	1,435	177	4,181	3,659	61,888

d. Tracks, Roads, etc.

There were no changes made in either tracks or roads on the property, but of course there was the usual maintenance, and a fence was placed across the South entrance to the mine so as to leave only one road in use and thereby guard against possible sabotage.

e. As was mentioned in last Year's report there was an extreme shortage of tamarack poles, used for covering down and fore poling, due to the heavy rains and impassable roads in the woods and therefore this year an exceptionally large amount was brought in to carry over the wet season. However, more of the hardwood stulls were being cut further from the main highways and with the shortage of man power due to the draft and other better paid occupations, this type of timber was very hard to get in sufficient quantities to stock up any reserve. During November the yards were almost empty and it was only due to the freezing weather coming at the last of the month that the mines were able to continue operating at that time. More of the timber has been brought in by railroad this year on account of the rubber situation, and also the hauls are getting longer each year as the jobbers have to go farther afield to find the proper sized timber. The time has also arrived when it is becoming more difficult to find tamarack for poles and cribbing, and therefore hardwood will have to be substituted where the material does not have to remain in place as long.

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e. Timber Yard (Cont.)

The operation of the timber treating plant, moved from the Athens Mine to the Maas Mine in 1941, was taken over by the Maas Mine in 1942. There was, however, only about 60% of the timber treated as compared with 1941 on account of receiving less peeled timber at the mine and not having any excess of regular mine timber that could be peeled on the property. With the scarcity of labor in the woods, the same conditions will probably exist through 1943, which is very unfortunate, as the treated timber could be used very advantageously on the 4th and 6th Levels at the present time. The following tables show a comparison for the last three years:

Cost Per Foot for Treating Timber

	1942	1941	1940
Peeling		.0200	.0480
Treating	.0575	.0558	.0375
Decking	.0125	.0098	.0048
Chromated Zinc Chloride	.0340	.0400	.0643
Heat, Water, etc.	.0125	.0125	.0138
Miscellaneous			.0232
Total	.1165	.1381	.1920
Number of Pieces Treated	243	405	221
Number of Feet Treated	2,187	3,743	1,989

Allocation of Treated Timber by Mines

Maas Mine	110 Pieces
Athens Mine	63 Pieces
Balance on Hand - January 1, 1943	70 Pieces

f. Drainage

There was no further test drilling or the putting down of any wells on surface during the year, although there is still the possibility that if a gravel seam could be found and another well installed, there would be considerable benefit underground. There was no further reduction in the amount of water pumped from underground as the pumping from the wells has apparently lowered the water table to a constant level. No. 3 Well had to be abandoned on account of the movement of the ground in the lower part pushing the pipe over too far to allow the lowering of the pump. Nos. 1 and 4 Wells were idle some of the time due to repairs to the pumps, but No. 2 Well pumped continuously throughout the year. The average amount pumped from surface and underground for the last three years is shown below.

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7. UNDERGROUND

a. Shaft-Sinking

There was shaft-sinking during 1942 in both the main shaft and the auxiliary winze, located on the 5th Level some 1400' South of the main shaft. An authorization for the development of the 6th Level was approved in November, 1941, and preparations were immediately started to enlarge the 6th Level plat, where the shaft had been previously bottomed, to make room for a hoist; and also to excavate a drift and plat West of the main shaft cross-cut on the 5th Level for the auxiliary winze. It was necessary to have a winze from which drifting on the 6th Level could be done simultaneously toward the ore body to the South, so as to have the ore raises to the 5th Level in readiness as soon as possible. The development of the 6th Level had been postponed after it was found by diamond drilling that all the ore below the 5th Level contained more than a normal percentage of sulphur. When it was reported by the Sales Department that they could sell this ore, during the present emergency at least, work was immediately pushed as hard as possible to open up this area, especially as the mining in the main ore body above the 5th Level had almost reached the level.

Main Shaft

The hoist was installed in January together with the necessary safety doors and loading chute in the ladder compartment where sinking started in February, during which month 16' was excavated and work continued here until May when the ladder compartment had been completed to a depth of 24' and the shaft enlarged to almost full size under a 12' pentice. This work was carried out on the four week-end shifts as there were not enough miners available to work in both this and the auxiliary shaft full time and still maintain enough contracts to keep up the full production of iron ore. It was decided then to concentrate on the auxiliary winze and therefore work was temporarily stopped here until the latter part of September when two crews were placed on day and midnight shift, it being impossible to work on the afternoon shift as they are then cleaning the skip pit of the ore spilled over from the skip during the preceding shifts. Both this ore and the shaft rock has to be handled in a small car hoisted on the cage from the 6th to 5th Level and then dumped into the pocket. There was considerable delay on the day shift due to the cage being used almost continuously to bring down the necessary amount of timber needed in the production of ore. The rock is an extremely hard quartzite and although various types and sizes of bits have been tried, none have been found that will enable the men using six machines to drill the cut in less than three shifts. The ladder compartment is 1' less than standard, being only 2' 6" in width and therefore the bucket has to be very small necessitating a much larger number of trips to clean out the cut. The shaft was completed to a total depth of 86' at the end of the year and work on the pocket and skip pit will start at once, after which the pentice will be removed and drifting start toward the winze. Probably by that date there will also be a contract drifting from the winze toward the shaft if it is possible to obtain the necessary miners, but mean while the ore and rock from the 6th Level will be hoisted on the cage in the auxiliary winze and brought to the shaft on the 5th Level.

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a. Shaft-Sinking (Cont.)

Table of Progress in Shaft During 1942

	Depth Sunk	Sets Installed
January	16' in Ladder Cpt.	0
February	8' in Ladder Cpt.	0
March	Excavating under 12' Pentice	0
April	Excavating under 12' Pentice	0
September		Bearers and 1 Set at 18'
October	30'	2
November	22'	3
December	10'	3
Total	86'	

Auxiliary Winze

After 400' of drifting on the 5th Level approximately 1400' South of the shaft had been completed and widened sufficiently to allow for two parallel tracks, the hoist room was cut and the 200 h.p. hoist installed. A two-compartment 14' x 11' winze was sunk 6' and bearers concreted in place, after which 35' of head room was excavated and the head frame erected together with the landing doors and loading pocket for handling the rock while sinking. During July and August the winze was completed to a depth of 104' by a crew of only six men working two shifts, and their advance of 35' in a two-week period broke all former records for shaft-sinking in any of the Company's large shafts. Approximately 30' was cut out on the 6th Level North and South of the winze and this was stripped on the West side to allow for double track after which drifting was temporarily stopped until all of the mechanical work necessary in installing the cage, counterweight, head sheaves, runners, ladders, etc. was completed. The sinking crew was removed to the main shaft where they continued until the end of the year. In the latter part of November a new rock drifting crew was organized and started to enlarge the winze plat on the 6th Level. At the last of the year this work had been almost completed and the drift had been extended 185' to the South toward the ore body. The drifting is being done with three Cleveland D-12 machines mounted on a movable Jumbo Frame, and the loading with an Eimco Finlay loader, the loaded cars being put on the cage and hoisted to the 5th Level for transportation to the main shaft.

b. Development

There was not very much ore development, outside of raises during 1942, but there was considerable development in rock, expecially toward the latter part of the year when there were 26 miners, including the shaft-sinking crew, employed in this type of work and there was being hoisted an average of approximately 3000 tons of rock per month which seriously interfered with the ore production.

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b. Development (Cont.)

Third Level

The 100 Cross-Cut in the East footwall pillar started in the fall of 1941 was completed with an advance of 70' in ore. The ground here is very heavy due to old square-set stopes, which were put up to the hanging on 100' centers several years ago, crushing and throwing weight on the pillars between. Four raises in all were completed from this cross-cut to the 375' Sub above.

Fourth Level

The most extensive development carried out during 1942 was on the 4th Level where the new North footwall drift was advanced toward the East 472' in transition slate and jasper. The 4200 Cross-Cut was turned off to the South and advanced 70' by the end of the year. The foot rock in this area is of such a slabby nature that it was not safe to work without timber and therefore the progress was considerably retarded, having to open a larger drift and put up sets. There still remained approximately 400' to be completed next year. Three raises were completed and three more started here during the latter part of the year, but it was impossible to cut out in those which were completed due to the large volume of water encountered upon reaching the old gob. It is expected that with these raises draining off the water that at least one of the next three raises will be dry enough to cut out and then a sub level drift can be driven to connect the tops of all those put up previously where the work can be done much more safely and also more efficiently. It may be necessary, however, to put up two or more raises directly on the footwall from which mining can be carried on in advance of those on the hanging side to drain off the excess water while mining is in progress. Five raises were also in progress from the 4100 Cross-Cut, three of which were completed during the year.

Fifth Level

The drift started late in the year to make room for the auxiliary winze was completed in the slate for a total distance of 400', being 200' North and South of the winze and wide enough to allow for a double track. Two raises were put up from this level during the year in the 5600 drift to take the places of those crushed when this area took considerable weight early in the year. Due to the explorations in the North footwall area above the 5th Level developing a considerable area of ore beyond the reach of raises from the present footwall drift, it will be necessary to drive another drift in ore starting near #5022 Raise and extending West as far as the ore warrants.

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Table of Ore and Rock

Location	Raising Ore	Raising Rock	Drifting Ore	Drifting Rock	Shaft Sinking
Third Level	243		53		
215' Sub	27		34		
100' Sub	137		100		
65' Sub	101	30			
Fourth Level	439	189		542	
Fifth Level	25				
Total	972	219	187	542	
E & A CC 78					
Fifth Level				371	
Sixth Level				293	
Main Shaft					86
Winze		35			106
Grand Total	972	254	187	1,206	192

c. Stoping
General

There was an average of 37 contracts mining during 1942 and approximately two-thirds of these were on three shifts, the other third being in the wet areas where it is more efficient to work only two shifts, allowing more time for the motor crews to clean out the dry chutes. When loading at a wet chute, the ore has to be scraped directly into the car, which is a much slower method and therefore the entire train crew is tied up until the contract has completed scraping. The dry ore can be stored in the longer raises and on the third shift, with no wet ore to delay them, all of the dry ore can be removed. Nearly all of the various mining blocks are affected by these wet areas and therefore each territory had both two and three-shift contracts employed.

Ten of the contracts spent the entire year in the East footwall pillar above the 3rd Level where mining had reached to within 30' of the level by December. The ore here is all of standard grade and with the exception of two contracts draining off the water on the footwall, the production in this area has had the best average per contract. Development is being pushed on the 4th Level in order to put up new raises by the time those on 3rd Level are no longer available. This area is decreasing in size very rapidly on account of the flattening of the footwall, especially in the Eastern end near the Negaunee Mine boundary.

There were two contracts mining in the West footwall pillar between the 3rd and 4th Levels, one of which completed mining in the stope to the West and just above the 215' Sub in February and then mined out the first two subs under the 3rd Level by the top slicing method. This area is adjacent to the stope on the East and is controlled by two raises from the 200' transfer drift below. Late in the year mining was temporarily abandoned until a new rock raise could be put up from the 4th Level to handle the ventilation, as continued work

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c. Stoping
General (Cont.)

here would cut off the present air passages. With the large rock program now in hand it will be necessary to defer this raise for some time. The other contract continued to mine in the area to the South of the stope and just North of the main dike and by the end of the year were only 40' above the 4th Level. This ore also was of standard grade.

Seven contracts continued to mine in the two blocks just East of the Race Course lease, four of whom were in the second block and by the end of the year had started to cut out just above the 4th Level. The three in the first block mined the first two subs below the 4th and were starting to cut out in the third sub. The ore here has been mostly of standard grade, but from the analysis of the raises put up in this area it is expected that there will be considerable high sulphur ore found on the next sub level. Early in the year mining was again started in the third mining block which had been abandoned when the 4000 Cross-Cut crushed. As soon as the new 4100 Cross-Cut further to the East on the 4th Level was completed, three raises were put up and mining pushed as rapidly as possible in order to try and relieve the weight of the jasper pillar above. This new cross-cut was repaired three times during the year and it was not until October that the effects of the mining above showed any material benefit. Two sub levels have been completed at the North end, while a lower sub level is now being mined under the jasper in the Southern part of this block.

Mining has been continuous in the small area above the 5th Level in the North footwall, where exploration carried out this year has shown the ore is extending to the West and also rising again beyond a jasper roll in the hanging that descended to the 65' Sub Level. A test raise to the West of this jasper horse continued in ore to 40' above the 4th Level, but drilling shows this ore body to be very narrow and it will probably not increase in width to the South until below the 65' Sub, approximately 90' below the hanging. The ore has all been of standard grade and will therefore show a substantial increase in the reserves of that grade. The remainder of the contracts, 14 in number, have been employed in the main ore body above the 5th Level in both Race Course and Maas leases. The ore has been almost entirely of high sulphur grade and mining at the end of the year had approached to within 40' of the level, necessitating new raises from the 6th Level, at least by the time one more sub level has been mined, and above some drifts it will probably not be possible to do any more mining without the consequent weight crushing the level timbers and making it impossible to keep them open for tramming.

It has been necessary to employ a very large crew of timber men to keep the main levels and chutes and raises in repair, as the majority of the workings are so close to the levels. There were 75 men employed in this type of work, besides which the miners themselves averaged 18% of their time repairing over the tops of the raises once or twice before they could complete removing their respective