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7. UNDERGROUND: (Cont'd)

b. Development: (Cont'd)

On the 6th level a drift was driven partly in ore but mainly in the footwall to make a new connection to No. 610 cross-cut and thereby eliminate that portion of the East-West haulage drift and No. 610 cross-cut that has been subject to extremely heavy pressure and crushing.

Late in 1941 a turnout was started for a new cross-cut on the 7th level. It will provide for raises that will extend from the 7th level to a sub above the 6th now being mined from three raises in No. 610 cross-cut.

The authorization for purchase of a new and larger ventilation fan for the Athens Mine made it necessary to start driving a by-pass drift on the 10th level in which to install the new fan. This new drift is located some distance from the shaft beyond the clean-out drift connecting with the sump of the main pumping plant. When the new drift is completed and the fan installed the sump can be cleaned without interfering with the free delivery of air from the shaft to the fan. This is not possible with the present fan which is located near the shaft. The old fan will be retained as a spare for use in case of an accident to the new fan.

b-1. Development in Ore:

A detail of the development in ore in 1941 follows:

-260' Sub - Above 4th Level

In October and November a transfer raise was put up from a drift North of No. 416 raise a distance of 45 ft. in ore to the jasper hanging. Mining was started here on the -220' sub level. In December a raise, No. 414, was completed in ore from the 4th level to the bottom of No. 414 transfer raise on the -260' sub level and these raises connected on the -260' sub level. The transfer raise and transfer drift on the -260' sub level was then abandoned.

-330' Sub - Above 4th Level

A small test raise was put up in ore from a drift, North of No. 402 raise on this sub level 45 ft. in ore to the jasper hanging. From a drift South of No. 402 raise on the -330' sub a raise was put up 15 ft. in ore to hole to the floor of a drift on the -320' sub level to provide for ventilation.

-340' Sub - Above 4th Level

A ventilation connection was driven on this sub level from No. 408 raise in the West cross-cut a distance of 100 ft. in jasper and 115 ft. in ore to make a connection to No. 418 raise in the cross-cut 240 ft. to the East. This drift was started in September and completed in November.

4th Level

The West cross-cut on this level was started in February and completed in April. The total advance was 311 ft. in ore.

The East cross-cut driven South from the footwall drift was started in April and temporarily completed in August. The total advance in ore was 220 ft.

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7. UNDERGROUND: (Cont'd)

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

No. 402 raise, located in the West cross-cut was started in March and extended 73 ft. in ore to a height of 83 ft. to the jasper at the -330' sub level elevation. This raise was later extended in jasper to the -300' sub level.

No. 404 raise, located in the West cross-cut, was started in May and completed in June after advancing 85 ft. in ore to a total height of 95 ft. to the jasper.

No. 406 raise, located in the West cross-cut, was started in May and completed in June to the jasper at a height of 52 ft. The advance was 42 ft. in ore.

No. 408 raise, located in the West cross-cut, was started in June and completed after an advance of 66 ft. in ore to the jasper at a height of 76 ft. above the 4th level.

No. 416 raise, located in the East cross-cut, was started in August and completed in September to the jasper at a height of 164 ft. The advance was 154 ft. in ore.

No. 418 raise, located in the East cross-cut, was started in August and completed in October to the jasper at a height of 135 ft.

No. 414 raise, located in the East cross-cut, was started in October and completed in December. It was in ore from a height of 38 ft. to top at a height of 155 ft. at the elevation of the -220' sub level.

An extension of the East cross-cut was started in December and advanced 33 ft. in ore.

A connection in ore for a ventilation airway from the top of the raise above the -460' sub level was made to the West cross-cut on the 4th level after an advance of 40 ft. in ore.

6th Level

The new drift driven Southwesterly from the haulage drift to the shaft in the 6th level to connect with No. 610 cross-cut advanced 96 ft. in ore before reaching the footwall in which it was continued.

There was a total of 35 ft. of drifting in ore from 7th level raises to make connection to the 6th level haulage drift to provide for ventilation and traveling roads.

In December a raise was put up in ore from the new 6th level haulage drift 44 ft. to the -550' sub level to provide another airway connection to the two main airway raises from the 6th to 4th level.

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7. UNDERGROUND: (Cont'd)

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

-625' Sub Level

A drift was driven from No. 711 raise on the South side of the fault dike North to No. 720 raise to improve ventilation. This airway drift advanced 20 ft. in ore to the fault dike, 20 ft. in rock through the dike and 65 ft. in ore North of the dike to No. 720 raise.

7th Level

No. 704 raise, located in the East-West haulage drift, was started in 1940 and finished in January 1941. It was extended to the -550' sub level 40 ft. above the 6th level. It advanced 66 ft. in ore in 1941.

No. 702 raise, located in the East-West haulage drift, was started in February and extended to the 6th level elevation and a connection made to No. 610 cross-cut. Later in the year it was extended up to the -550' sub level. The total ore raising in No. 702 raise was 135 ft.

No. 713 raise, located in No. 1 cross-cut, 7th level, was started in July and completed early in September at a height of 186 ft. at the elevation of the -530' sub level 60 ft. above the 6th level.

There was a total of 387 ft. of raising in ore on the 7th level in 1941.

The following is a summary of development footage in ore for 1941:

	Drifting	Raising	Total
-260' Sub		45'	45'
-330' Sub		60'	60'
-340' Sub	115'		115'
-460' Sub	12'	67'	79'
4th Level	585'	807'	1392'
6th Level	131'	44'	175'
-625' Sub	85'		85'
7th Level		387'	387'
Total - 1941	928'	1410'	2338'
Total - 1940	78'	472'	550'
Increase	850'	938'	1788'

There was an increase of over 400% in footage of ore drifting and raising in 1941, largely due to development of the 4th level.

b-2. Development in Rock:

A detail account of development work in rock is given herewith:

-330' Sub - Above 4th Level

There was a total of 35 ft. of rock raising above this sub level in a test raise which was later enlarged to full size.

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7. UNDERGROUND: (Cont'd)

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

-340' Sub - Above 4th Level

There was 100 ft. of rock drifting on this sub level in making a connection from No. 408 raise to No. 418 raise for ventilation between the West and East cross-cut raises above the 4th level.

4th Level

In development of this level there was 446 ft. of rock drifting on the main level in the East footwall drift and the East cross-cut. No. 402 raise in the West cross-cut was extended 18 ft. in the hanging jasper.

-460' Sub - Between 6th and 4th Levels

There was 10 ft. of rock drifting on this sub level in making a ventilation connection to the West haulage cross-cut on the 4th level.

6th Level

There was a total of 252 ft. of rock drifting in the new connection driven Southwesterly from the haulage drift to the shaft to No. 610 cross-cut. This new connection made it possible to abandon for haulage that part of the East-West haulage drift and the curve into No. 610 cross-cut that has required constant repair work and due to crushing has often interferred with production.

-625' Sub Level

In driving a ventilation connection on this sub level from No. 711 raise to No. 720 raise the drift advanced 20 ft. through the fault dike.

10th Level

The by-pass drift being driven on the 10th level advanced 67 ft. in December 1941. This drift will be 232 ft. in length and the new 80,000 cu. ft. ventilation fan will be installed here early in 1942.

Skip Pit - Bottom of Shaft

When the shaft was sunk only a small skip pit clean-out drift was driven connecting the cage road on a sharp curve with a small cut-out behind the skip roads. Modern practice provides for 40 ft. to 50 ft. of straight drift from the cage road with a switch to bring the skip pit car in line with a scraper slide for loading the skip pit dirt. On the three shift operating schedule the cleaning of the skip pit is quite a problem and with the present layout can not be completed in one eight-hour shift each day the mine operates. A start was made in 1941 to modernize the skip pit layout and the drift from the cage road was extended 27 ft. and widened to make room for the switch. The balance of the work must be handled very carefully as it involves removal of hard ground immediately behind the skip roads. This work can only be done on Sunday when the mine is idle and it will require several months to complete the work here.

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7. UNDERGROUND: (Cont'd)

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

The following is a summary of the rock development footage for 1941:

	Drifting	Raising	Total
-330' Sub		35'	35'
-340' Sub	100'		100'
4th Level	446'	18'	464'
-460' Sub	10'		10'
6th Level	252'		252'
-625' Sub	20'		20'
10th Level	67'		67'
Skip Pit Drift	27'		27'
Total - 1941	922'	53'	975'
Total - 1940	635'	500'	1135'
Increase	287'		
Decrease		447'	160'

c. Stoping:

(1) General:

The increase in production in 1941 was made possible by the opening of the 4th level for mining in the East half of block 4 and in block 5. The product in 1941 came from blocks 2, 3, 4, and 5, and by levels from above the 9th, 7th, 6th, and 4th levels. Above the 4th level ore was mined on the -220', -260', -290', -300', -315', -330', and -340' sub levels, above the 6th level on the -470' and -485' subs South of the dike, the -500' and -515' subs North and South of the dike, the -530' and -540' subs North of the dike and on the -550' and -565' subs South of the dike, above the 7th level on the -575' sub, 6th level, -600' and -615' subs all in block 3, and on the -625', -635', and -645' sub levels in the North half of block 3, and above the 9th level on the -770' sub level, 8th level, -800' sub and -815' sub level in block 2. There were twenty-four sub levels and two main levels on which ore was mined in 1941 as compared with a total of seventeen sub levels in the previous year. The development of a number of small ore bodies that occur as risers in the hanging above the 4th level accounts for the seven sub levels opened here in blocks 4 and 5 while the more rapid rate of mining accounts for more sub levels mined in other areas. Also in some areas the size of the ore area has decreased resulting in the ore on the sub level being mined in a shorter period of time.

The main product came from block 3, both North and South of the fault dike above the 7th level. There was also a large increase in the product from the 9th level where mining is underway in block 2. The ore mined above the 6th level came from the West one-half of block 4. The mining here is underway in three steps or elevations, two South of the fault dike and one North. The highest sub level at the end of the year was the -515' sub 80 ft. above the 6th level, the next elevation was the -540' sub 45 ft. above the 6th and the third or lowest was the -565' sub only 30 ft. above the 6th level. Ore on the -540' and -565' sub levels is handled through 7th level raises.

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7. UNDERGROUND: (Cont'd)

c. Stoping: (Cont'd)

(1) General: (Cont'd)

There were three wet areas mined in 1941, viz., North of the fault dike above the 6th level, near the South footwall in the large area being mined South of the fault dike a short distance below the 6th level, and the area being mined in block 2 above the 9th level. When the exact location of the incoming water is found on a sub level, it is usually possible to drift to this spot on the next lower sub level and by means of drain pipes carry the water to the raise and down to the level. Where this plan can be followed a considerable area can be mined without interference from water. However, in the area adjacent to one raise above the 7th level and two raises above the 9th level, the water comes in over a large area and can not be confined to one drift. The ore here is very wet and has to be scraped directly into cars on the level. In the long transfer raises at the shaft the wet ore is mixed with the dry ore. It, however, causes trouble in the transfer raises by building up on the foot of the raise and often blasting is necessary to start it moving. The water encountered North of the fault dike above the 6th level comes in from an old diamond drill hole from surface and is confined to one small area.

(2) Detail of Stoping:

The different areas mined in 1941 are reported separately as in previous years starting with the highest area in block 5 above the 4th level.

South of Fault Dike - Block 5 - Main Ore Body Above 4th Level

Up to the close of the year the highest area opened for mining above the 4th level was on the -220' sub level 175 ft. above the 4th level. Here the ore occurs in the sharp upward roll in the hanging for only a short distance to the West the hanging was found 80 ft. lower. Mining was started here in December 1941 and the extent of the ore at this elevation has not yet been determined. There is only one contract working at this elevation as the hanging has not permitted adjoining raises to be extended to this elevation. Raises adjacent to this area have been connected on the -260' sub level to provide ventilation and a traveling road. Above the West cross-cut on the 4th level the ore was found to extend in one of the raises near the footwall 105 ft. above the 4th level. It was discovered to extend to this elevation in a transfer raise put up 45 ft. in ore above a sub level opened under the hanging. The ore in this area was much larger on the next or -300' sub level, where mining was underway at the end of the year. Another riser in the hanging was found in a small area 70' x 50' in size from another raise in the West cross-cut 90 ft. above the level. Here the ore has been mined also on the next lower sub level where it was somewhat larger. Near the South side of the ore body the hanging was encountered 65 ft. above the 4th level and the ore mined in a small area directly under the hanging. Here it was cut off on all sides by the jasper and was only 50' x 50' in size. On the next lower sub level, 55 ft. above the 4th level, a drift was driven from the West cross-cut over to the East cross-cut a distance of over 200 ft. to connect two raises to provide ventilation. To make this connection it was necessary to drift nearly 100 ft. through the jasper hanging from the riser on the West side over to another riser above the East cross-cut.

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7. UNDERGROUND: (Cont'd)

c. Stoping: (Cont'd)

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

It will be noted that all the mining above the 4th level has been confined to relatively small areas where the ore has been found to extend upward into the hanging. Considerable development was necessary to find the tops of these risers which in most cases were not found by the raises put up from the main levels. In several cases the ore was found by exploratory raises put up from drifts driven on the sub levels. It is necessary to mine several sub levels before the ore body becomes large enough to give results in output comparable with other areas where mining is underway some distance below the hanging. In only one small area above the 4th level is mining underway in the East half of block 4. As mining progresses to lower elevations the ore will extend into the East half of block 4 but most of the ore in this block will eventually be mined from raises located on the 6th level.

South Side of Fault Dike - West Half of Block 4 -
Ore Body On The South Footwall Above The 6th Level

At the first of the year mining was underway on the -470' sub level from three raises above No. 610 cross-cut on the 6th level. Mining of this particular area was started in 1935 at the elevation of the 4th level. The area here was quite large but as mining progressed to lower elevations the footwall advanced from the East and has decreased the ore area on each succeeding sub level. The footwall on the -470' sub level was 30 ft. East of the raises and reached the raises on the next lower sub level further decreasing the size of the ore body. Mining was practically completed in this area on the -500' sub level at the end of the year and two of the contracts had started to mine on the -515' sub level at the end of December. On this sub level the raises were actually located in the footwall. This sub, the -515' where mining has just been started, is 80 ft. above the 6th level and in anticipation of the early loss of these raises due to their location back in the footwall, a cross-cut has just been started on the 7th level from which raises will be put up to mine this area. This area is now only 220 ft. in length, North and South, and 100 ft. in width.

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

In order to relieve pressure on the 6th level haulage drifts, mining of an area 160 ft. wide by 180 ft. in length was underway from four raises and progressed more rapidly than the larger area being mined further South on the footwall. Mining was underway here in 1940 on the -550' sub level 40 ft. above the 6th level. After mining on this sub level was completed early in 1941, work in this area was stopped until in November when it was resumed from two 7th level raises. In the meantime a new connection had been made to No. 610 cross-cut by a drift to the South of this area in the footwall.so that it was possible to resume mining here 25 ft. above the 6th level. This will soon result in the loss of the old East-West haulage drift on the 6th level which is no longer in use except as a traveling and ventilation drift.

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7. UNDERGROUND: (Cont'd)

c. Stoping: (Cont'd)

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

North Side of Fault Dike - West Half of Block 4 - Above 6th Level

This area was mined by two contracts on three sub levels during 1941 and development of the fourth sub level was underway at the end of the year. At the end of 1940 mining was about 50% completed on the -500' sub level 110 ft. above the 6th level and at the end of 1941 was underway on the -540' sub level 60 ft. above the 6th level. It became so difficult to maintain the two raises to this area due to heavy pressure as also the haulage drift beneath on the 6th level that a raise was put up from No. 1 cross-cut on the 7th level. During the last two months of the year mining was underway from one 7th level and one 6th level raise. The cost of maintaining the 6th level haulage drift under this area has become prohibitive and it is planned to shortly abandon this drift but keep it propped for a ventilation and traveling road. The balance of the ore here will be mined from raises above No. 1 cross-cut on the 7th level. One other raise will be put up into this area from the 7th level. The slate footwall on the East side of this area is advancing much more rapidly than the mining limit at the West side is receding so that the area on each succeeding sub level is smaller. In fact, on the -540' sub level the footwall flattened and advanced 20 ft. in a vertical distance of 12 ft. This area is now approximately 120' x 90' in size, whereas the first of the year it was 150' x 90' in size.

South Side of Fault Dike - Block 3

This is the largest area ever developed for mining in the Athens Mine. It is the full width of block 3, viz., 300 ft., and extends from the South footwall to the fault dike, a distance of approximately 300 ft. At the first of the year one contract finished mining two small pillars on the -575' sub level while there were eight gangs mining on the next lower sub level which is at the elevation of the 6th level. Mining on this sub level was completed in the early Summer and the -600' sub level opened and all mined by the end of the year except one small pillar. Development of the -615', the next lower sub, was underway by several gangs of miners at the end of the year. As mining has progressed to lower elevations the width of the deposit from the South footwall to the dike is gradually decreasing and it is now only about 230 ft. wide as compared with 300 ft. the first of the year.

North Side of Fault Dike - Block 3

This ore area is much smaller than the area South of the dike and mining consequently is advancing more rapidly. The first of the year mining was underway on the -625' sub level 35 ft. below the 6th level by three contracts. During the year mining was completed in the East half of the -635' sub level and also nearly completed in the West half which is much larger. Two contracts were mining the two remaining pillars in the West half at the end of the year. The development of the -645' sub level has just been started in the East half of this ore body. The East half of this area which is being mined by one contract is 95' x 140' in size.

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7. UNDERGROUND: (Cont'd)

c. Stoping: (Cont'd)

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

Conditions are very favorable for mining. The ore is free from water, is quite soft which shortens the drilling cycle and pressure is not excessive so that no repairing over the raises is necessary during the period required to mine the ore on the sub level. Mining in this area in block 3 is now only 40 ft. above the 7th level. During the coming year it will be necessary to develop the 8th level by a cross-cut and put up raises to permit mining to be continued in this area.

Block 2 - Area Near South Footwall Above 9th Level

Mining of the small ore body between the South footwall and the fault dike was resumed in 1940 and completed early in 1941. The ore was cut off by the footwall just below the 8th level on which elevation mining was underway at the end of 1940. Mining was completed here by one contract early in March 1941. This area was very wet and mining was carried on under a serious handicap due to the water. The ore was very soft and plastic and was easily dislodged by the streams of water coming in from the back of the slices. Forepoling was necessary ahead of every timber set and only three or four holes were blasted for every 5 ft. advance. The raises to this area now convey the water to the 9th level and keep it away from the ore area North of the fault dike.

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

With the completion of several raises from the 9th level early in 1940, mining was started on the -760' sub level elevation by two contracts. At the end of 1940 mining was nearly completed on the -770' sub level. In 1941 mining was completed on the -770' sub level, the 8th level, the -800' sub level and was underway on the -815' sub level at the end of the year.

Six contracts worked here during 1941. The ore body in block 2 at the elevation of the 8th level was 220' x 280' in size. Block 2 is 220 ft. in width so that this dimension remains the same on each sub level. The North-South dimension decreases on each lower sub level due to the Northward advance of the slate footwall. On the -815' sub 25 ft. below the 8th level, the area is 220' x 235' in size.

Water is encountered in several parts of the ore area, i.e., along the South footwall and also in one area on the dike which is the North boundary of the ore trough. At times water was a serious hindrance to mining operations but after drifts were driven along the footwall and drain pipes installed it was usually possible to keep the water out of the slices. The ore area in block 2 is directly beneath the cave to surface which accounts for the large amount of water found here. There is now an excellant timber mat in this area and the ore is uniformally soft and easy to drill. Production here is considerably above the average for the balance of the mine.

Work done on the 4th, 6th, 7th, 9th, and 10th levels has been described previously in this report under the heading "Development In Ore And Rock".

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7. UNDERGROUND: (Cont'd)

d. Timbering:

The total cost for timbering, labor and supplies, increased $106,071.14 in 1941 and in cost per ton $ .072. The cost per foot for stull timber was only 1% higher than in 1940 and for lagging and poles was practically the same in both years. The total amount of timber, lagging and poles used in 1941 increased due to larger production and more shifts operated. The cost per ton for timber, lagging, poles, and wire netting decreased about 10% and was the lowest in more than ten years. Slightly less timber, lagging and poles were used per ton of ore than in 1940. The increase in cost per ton in account No. 6 "Timbering", on the Cost Sheet, is due largely to increase in wages. The total cost of $ .517 per ton "timbering" was $ .073 higher than the cost of "Stoping" which was $ .440 per ton. The spread in the cost of Stoping and Timbering gives a clear picture of the amount of crushing that has to be contended with in the operation of this mine. The heavy pressure effects both haulage drifts and raises, and increases the number of overtime shifts at week ends.

The greater part of the cost of timbering in 1941, as also in prior years, was for labor repairing drifts and raises. On account of the high cost it warrants a detailed explanation which is given herewith.

The main area under excessive pressure was confined to the East-West haulage drifts North and South of the fault dike on the 6th level, the same as in 1940. It is probable that the excessive pressure here is due to the pillar of ore above the drifts actually slipping on the face of the fault dike thereby throwing a large part of the weight of the ore in the pillar directly on the timber in the drift. The tendency of the ground to slide on the face of the fault dike was exemplified by the cave to surface a few years ago when a large mass many hundred feet in thickness slid down from surface between two dikes.

Where the drifts have been repaired many times evidence of the settlement of ground above the drift is visible many feet above. When a drift is repaired it is necessary to remove from 3 ft. to 5 ft. of ore from the back and 3 ft. or more on each side. The removal of this amount of ore a number of times can not fail but be evident on the sub levels above where the timber mat is always found to be considerably lower directly above the drift.

Repair work in the raises in No. 610 cross-cut on the 6th level disclosed loose swelling ground 100 ft. above the 6th level in footwall material. This demonstrates how the pressure effects the raises even when they are in footwall material. It had been expected that mining in the West half of block 4, a short distance above the 6th level in the area under the most severe pressure would effect a reduction in pressure and hence reduce repair costs. This did not work out as expected and it was then decided to abandon haulage on the 6th level in this area. Before this was possible it was necessary to drive a new drift in the footwall to reach No. 610 cross-cut some distance South of the East-West haulage drift in ore and to put up two raises from the 7th level for mining the ore directly above the East-West drift. When this work was completed in the Fall the old haulage drift was propped to keep it open for ventilation and for a traveling road and mining resumed 25 ft. above. The haulage

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7. UNDERGROUND: (Cont'd)

d. Timbering: (Cont'd)

drift North of the fault dike presented a similar problem and was under constant repair. This drift gradually grew more difficult to maintain and eventually segeral repair gangs could not keep it open for haulage without delays occuring. Ore was trammed here from two raises above the 6th level in the small ore body North of the fault dike. These two raises were also very hard to keep open and to solve this problem one raise has been completed from the 7th level to the sub level 60 ft. above the 6th level where mining is underway and a second raise will soon be completed. At the end of the year the new 7th level raise and one raise from the 6th level was in use. The pressure on this haulage drift was so excessive that sets of large hardwood timber, 18" in diameter, crushed in two weeks after installation. It is planned to abandon this drift in January 1942 and try to keep it open by installation of lining sets and many large props. It is needed for ventilation as it connects with a drift in the footwall to a ventilation raise in rock direct from the 10th level. The transfer of haulage from the 6th to the 7th level will materially reduce repair expense and this will be reflected in timbering costs in 1942.

Some areas above the 7th level are beginning to show signs of increasing pressure but as yet there has been no great difficulty in keeping them open for haulage. A number of raises on the 7th level in block 3 have required repairs in 1941 due to crushing, wear on cribbing, and rotting of cribbing.

Regular repair gangs have worked all the year repairing raises throughout the mine and many mining gangs have been out of their working places for short periods on this work. Repairs were also required to the timber in the 8th and 9th level haulage drifts but this was mainly confined to normal repairs due to rotting of the timber.

Statement of Timber Used:

	Lineal Feet	Avg. Price Per Foot	Amount 1941	Amount 1940
6" to 8" Cribbing	117,361	.0362	4253.45	3930.77
8" to 10" Stulls	25,357	.0673	1706.66	3153.82
10" to 12" Stulls	148,650	.0954	14188.38	11216.52
12" to 14" Stulls	77,739	.1308	10168.00	8143.18
14" to 16" Stulls	14,383	.1321	1899.43	1705.51
Treated Timber	409	.3576	146.24	666.96
Total 1941	383,899	.0842	32362.16	
Total 1940	345,583	.0833		28816.76
Lagging - 7 ft.	1,686,973	.7720 C	13022.60	10741.56
Poles - 9-1/2 ft.	1,597,209	1.3729 C	21928.31	19568.09
Total 1941	3,284,182	1.0642 C	34950.91	
Total 1940	2,849,377	1.0637 C		30309.65
Wire Fencing - Feet	4,455		276.86	463.25
Grand Total - 1941			67589.93	
Grand Total - 1940				59589.66

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7. UNDERGROUND: (Cont'd)

d. Timbering: (Cont'd)

Statement of Timber Used: (Cont'd)

	Amount 1941	Amount 1940
PRODUCT	648,750	515,725
Feet of Timber per Ton of Ore	.5918	.6701
Feet of Lagging per Ton of Ore	2.6003	2.6725
Feet of Poles per Ton of Ore	2.4619	2.8525
Feet of Lagging Per Ft. of Timber	4.3943	3.9882
Cost Per Ton For Timber	.0499	.0559
Cost Per Ton For Lagging	.0200	.0208
Cost Per Ton For Poles	.0338	.0379
Cost Per Ton For Wire Fencing	.0004	.0009
Cost Per Ton For Timber, Lagging, Poles & Fencing	.1041	.1155
Equivalent of Stull Timber to Board Measure	848,278	722,146
Feet of Board Measure Per Ton of Ore	1.3075	1.4000
Lineal Feet of Fencing Per Ton of Ore	.0069	.0156
Square Feet of Fencing Per Ton of Ore	.0286	.0653

Total Cost for Timber, Lagging, Poles, etc.

Year	Product	Amount	Cost Per Ton
1941	648,750	67,589.93	.1041
1940	515,725	59,589.66	.1155
1939	404,877	47,153.83	.1164
1938	268,050	35,920.27	.1340
1937	443,098	49,763.66	.1123
1936	310,888	35,719.77	.1149
1935	192,534	22,585.11	.1173
1934	162,706	19,546.06	.1201
1933	147,368	11,372.50	.2401
1932	76,525	11,794.89	.1541

e. Drifting and Raising:

The following table gives comparative figures of drifting and raising footages for the years 1941 and 1940:

	Drifting			Raising			Grand
Year	Ore	Rock	Total	Ore	Rock	Total	Total
1941	928'	922'	1850'	1410'	53'	3313	3313'
1940	78'	635'	713'	472'	500'	972'	1685'
Increase	850'	287'	1137'	938'		491'	1628'
Decrease					447'		

There was a large increase in the total development footage in 1941 due mainly to the reopening of the 4th level for ore production. In order to maintain the large production scheduled for the duration of the war, development work must be continued during 1942.

7. UNDERGROUND: (Cont'd)

f. Explosives, Drilling and Blasting:

The cost per pound for powder was the same in 1941 and 1940. The expenditure for powder increased $6,129.71 and the cost per ton of ore $ .0008. The total cost per ton for fuse, caps, etc. was $ .0003 higher than in 1940. The total cost however, is the lowest of any of the mines in the Negaunee District due to the ore being softer and less drill holes required to break it in both slicing and drifting.

Gelamite No. 1 was used exclusively in 1941 as also in 1940. The main advantage in the use of this powder as compared with Gelatin powder is the increase of 25 sticks per 100 lbs. while in strength, pound for pound, it rates the same as 60% Gelatin. The fumes from the Gelamite powder are not as objectionable as the fumes from Gelatin powder. The capped fusees are distributed at the dry house and the powder from underground powder houses.

Statement of Explosives Used: (Ore Development and Stoping)

	Quantity	Average Price	Amount 1941	Amount 1940
No. 1 Gelamite	242,886	11.50	27,931.86	21,802.15
Fuse - feet	1,015,520	5.13	5,208.23	3,992.47
Caps - No. 6	139,065	12.20	1,696.57	1,353.34
Electric Detonators	1,425	10.99	156.56	91.27
Tamping Bags	26,000	2.23	58.00	42.00
Fuse Lighters	27,500	6.75	185.68	118.16
Connecting Wire - lbs.	100	.48	48.00	32.00
Shot Firing Cord - ft.	500	13.20	6.60	5.95
Cap Crimper				50.65
Cap Seal				7.20
Total Fuse, Etc.			7,360.24	5,693.04
Total All Explosives			35,292.10	27,495.19
PRODUCT			648,750	515,725
Pounds Powder Per Ton of Ore			.3716	.3676
Tons of Ore Per Lb. of Powder			2.6909	2.720
Cost Per Ton For Powder			.0431	.0423
Cost Per Ton For Fuse, Caps, Etc.			.0113	.0110
Cost Per Ton For All Explosives			.0544	.0533
(Sinking, Rock Development, Etc.)				
60% Gelatin	950	11.50	109.25	150.00
No. 1 Gelamite	6,114	11.50	703.14	651.60
Total Powder	7,064		812.39	801.60
Fuse - feet	26,760	5.13	137.22	109.49
Caps - No. 6	3,690	12.20	45.04	37.46
Electric Detonators	75	12.11	9.08	148.77
Shot Firing Cord - ft.	500	13.20	6.60	11.15
Total Fuse, Etc.			197.94	306.87
Total All Explosives			1,010.33	1,108.47
Total Explosives Used in Mine			36,302.43	28,603.66
Average Price Per Pound for Powder			.1150	.1150

7. UNDERGROUND: (Cont'd)

g. Mining and Loading:

As was forecast in the 1940 annual report, tramming costs increased in 1941 due to tramming from four levels as compared with three in 1940. Part of the increased cost of $ .027 per ton of ore was however, due to the increase of $ .10 per hour in wages effective April 1, 1941. Haulage on four instead of three levels increased the labor cost due to one additional locomotive crew. The cost was, however, less than might have been anticipated due to the increase in production. A decrease in cost will occur for a short period in 1942 when tramming is abandoned on the 6th level but this will be of short duration as tramming on the 8th level will have to be started in 1942.

The heavy production scheduled for 1942 and probably for several years thereafter will make it necessary to continue to maintain tramming on at least four levels. This is due to the method of mining at this property of blocks of relatively small horizontal area. It will be recalled that the original plan of mining the Athens ore body was by blocks two to three hundred feet in width working upward from the bottom of the mine. The unexpected cave to surface destroyed the obvious advantage of this plan and since the cave the new areas opened for mining have been increased in width so that the system of mining is now practically the same as in the other soft ore mines. In blocks 2 and 3 the old system persists as these blocks were partially mined when the cave occurred.

There was no change in the general mining practice in 1941 except in the lengthening of the scraper haulage distances. These now reach distances up to 200 ft. in length as compared with a maximum of 150 ft. a year ago. However, these longer haulage distances are only economical with 20 H.P. continuous rated motors on hoists with a rope speed of 300 ft. per minute on the pull rope and 400 ft. per minute on the return rope.

More rapid mining on the three shifts per day and seventeen shifts per week schedule has reduced retimbering over the tops of raises that, with a slower rate of mining, often had to be retimbered once or twice before all the ore was mined. Maintenance at the tops of the raises has also been made easier by the building of substantial bulkheads, which practice has been in effect for several years. Besides reducing the repair costs the bulkheads have materially increased safety. Bulkheads are also used in the long slices to prevent blasted down areas from wrecking the timber clear back to the raises. The practice of blasting down two slices at a time has proven a great safeguard for the miners as the bulkhead built at the point where the last slice started stops the cave. Occasionally however, the slices break down after blasting and also the drifts break down back to the bulkheads near the raise. This is due to the rapid rate of mining that does not give the timber mat time to settle and compact before mining is underway on the next lower sub. The release of support caused by blasting down two slices causes a settlement of the uncompacted mat over a large area and occasionally throws enough sudden pressure on the timbered drift back of the slices to break it down. However, the miners are out of danger at this time due to moving out when blasting. A few breakdowns have occurred when advancing a slice from sudden settlements of the timber mat on the sub above and here the training of an experienced miner is the only safeguard. The cracking of the timber and a trickle of loose ground warns him to get out as quickly as possible.

Large size cribbing has continued to be used at the mine as its longer life warrants the extra expense incurred by its use.

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7. UNDERGROUND: (Cont'd)

h. Ventilation:

Ventilation has been good during the year due to maintenance of sufficient airways between the levels. The importance of an adequate supply of fresh air to each working place and uninterrupted operation of the fan in order that maximum production be obtained justified the purchase of another fan of larger capacity. E. & A. No. AM-6 - "ventilation equipment", was authorized late in September and a fan of 80,000 cu. ft. capacity purchased. Delivery is promised in March 1942. The new fan is double the capacity of the old fan and operates against a higher water gauge pressure. The old fan will be kept in condition to operate in case of accident to the new fan. The present fan is located near the shaft on the side of the drift leading to the shaft pocket. A series of air lock doors controls the air entering and leaving the fan. When tramming to the shaft pockets the opening of the air lock doors interfers seriously with the air supply. To remedy this condition a by-pass drift is being driven several hundred feet from the shaft to house the new fan. An air lock will be provided in the main haulage drift opposite the by-pass drift so that haulage trains coming out to the shaft can be locked past the fan without disturbing the air supply. The clean-out drift for the main pumping plant sump is near the shaft so that with the new fan in commission the sump can be cleaned at any time without interference with the ventilation system. With an adequate supply of air available the ventilation problem at this mine is the maintenance of sufficient airways between levels to permit the air to circulate without building up a back pressure that seriously reduces the volume. The 10th level airway drift runs Southwest from the shaft while the 4th level drift runs Southeast of the shaft. The horizontal distance from the main airway raise in rock on the 10th level to the airway raises reaching the 4th level is approximately 600 ft. and the difference in elevation is also 600 ft. Expressed in a different way, the air travels 600 ft. horizontally and 600 ft. vertically in its passage from the 10th to 4th level. However, the distance traveled is much greater as the air is forced back into the mining areas by doors in the drifts and reaches the level above through the raises in the mining areas. It is safe to say that fully 50% of the air travels nearly 2,000 ft. and the other 50% 3,000 ft. or more in its journey from the inlet on the 10th level to the skip road on the 4th level where it exhausts to surface.

To obtain the best results in ventilation the air should be split, with the greater part reaching the 4th level on the South side of the ore body. The layout of the drifts on each level is governed by the location and size of the ore body and does not always permit of locating the airway raises in the correct position. One of the main airway raises from the 10th level to the 6th level is located in the dike which forms the North boundary of the ore body and is 500 ft. West of the 4th level haulage drift and also is located on the North side of the ore body.

A careful study is being made of the ventilation problem and already several rock drifts and rock raises are indicated as essential for proper and adequate ventilation. The increase in volume of air available when the new fan is operating makes it necessary to provide additional airways between the levels.

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7. UNDERGROUND: (Cont'd)

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. Gals.Per Min. - Athens	Total Cost Both Mines From Athens Cost Sheet
January	3840	800	330	$ 2196.79
February	3820	700	327	2064.70
March	3803	100	324	2119.21
April	3930	1800	334	2171.37
May	3290	3200	334	2678.85
June	3318	2600	367	2305.42
July	4510	1900	386	2571.01
August	4307	1700	363	2327.05
September	4184	1000	363	2421.09
October	4170	1800	360	2327.56
November	4117	3100	365	2320.01
December	4806	3900	397	2715.63
Avg. 6 Mos. 1935	3103	4366	265	2087.93
Avg.Year 1936	2949	3583	255	1766.08
Avg.Year 1937	3003	3283	257	1749.12
Avg.Year 1938	3767	3433	314	2350.42
Avg.Year 1939	3991	4391	331	2291.90
Avg.Year 1940	4141	858	351	2381.69*
Avg.Year 1941	4008	1883	354	2351.56

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

Average cost in 1934 prior to pumping at the Breitung	2611.79
Saving in 1935 when expense was heavy account of installing Pump at Breitung	2600.59
Saving in 1936	10148.52
Saving in 1937	10352.04
Saving in 1938	3135.96
Saving in 1939	3838.65
Saving in 1940	2761.20
Saving in 1941	2922.76

The water pumped at the Athens Mine in 1941 increased and averaged higher than in any year since the cave to surface in 1933. It increased in 1940 and at that time it was difficult to explain the increase. The extension of the cave to surface in 1941 however, explains the increase in both 1940 and 1941 as undoubtedly the ledge was breaking in the Summer of 1939 when the average rose to over 300 gallons per minute from a low of 279 gallons in March. This is borne out by the fact that it has not receded to less than 318 gallons per minute in any month since March 1939. The low point in 1941 was in March when it was 324 gallons per minute.

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7. UNDERGROUND: (Cont'd)

i. Pumping: (Cont'd)

It was again increasing at the end of 1941 as it averaged 397 gallons in December, a gain of 48 gallons per minute over the amount pumped in December 1940. Reference has been made elsewhere in this report to the extension of the break to surface to the South of the mine workings in blocks 2, 3, and 4. This break has produced a settlement of several feet for a distance of 500 ft. or more. This break permits the surface water to enter the mine over a much larger area. This is evident in the mine as there are now several areas that are quite wet that formerly were dry. It is hoped that there will be no great increase beyond the present amount except following the Spring breakup when the increase is normally from 60 to 80 gallons per minute in the months of May, June, and July. The main sump was cleaned late in 1940 when over 700 cars of mud were removed. It had required two years for it to fill at that time. It is now filled again and will be cleaned in the Spring of 1942 after the new ventilation fan is installed.

Less water was pumped at the Breitung shaft in 1941 than in any year since pumping was started there with the exception of 1940. It appears that the new break to surface is draining away some of the ground water that formerly reached the Breitung shaft.

The cost per ton for pumping in 1941 was lower than in 1940 due to larger production. The actual expenditure for pumping was $ 361.09 lower due to extraordinary expense in 1940 for cleaning the sump. The increase in wages in 1941 was offset by less time for pumpmen helpers due to the mine working more shifts. A pumpman helper works with the pumpman whenever the mine is idle. In May and June the Athens water was pumped to the 1,000 ft. level and drained to the Negaunee Mine where it was pumped to surface. The Athens Mine water was pumped by the Negaunee Mine during the time that was required to install a new discharge on surface for the mine water so as to remove it from the area involved in the new break to surface.

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	1941	1940	1939	1938	1937	1936	1935
January	330	325	297	266	244	242	367
February	327	318	282	273	239	244	361*
March	324	322	279	277	237	235	313
April	334	318	293	305	242	238	292
May	334	340	338	343	266	261	290
June	367	380	357	364	269	274	293
July	386	420	382	341	271	284	288
August	363	350	375	333	271	266	278
September	363	369	360	336	263	258	263
October	360	373	348	311	262	261	261
November	365	343	334	307	260	255	253
December	397	348	329	309	263	249	249
Average	354	351	331	314	257	256	292

(*) Pumping started at the Breitung shaft.

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7. UNDERGROUND: (Cont'd)

j. Shaft:

Expense for maintenance of the shaft was practically the same as in 1940. There was no expense for casing the shaft and guniting in 1941 but this was offset by a large expenditure for repair of underground pockets. The enlargement of the skip pit drifts at the bottom of the shaft was also charged to this account. The breaking of the concrete front of the transfer raises from the 9th Level at the shaft pocket on the 10th level, as also the dividing wall in the 10th level shaft pocket required extensive repairs and accounts for the major portion of the expense of $3,215.65 in the sub account "Underground Pockets". A new timber for the guides for the fingers that form the doors of the shaft pockets was prepared ready for installation on the 8th Level to replace a rotted timber.

8. COST OF OPERATING:

a. Comparative Mining Costs:

	1941	1940	Incr.	Decr.
PRODUCT	648,750	515,725	133,025	
Underground Costs	1.453	1.313	.140	
Surface Costs	.163	.167		.004
General Mine Expense	.211	.200	.011	
Cost of Production	1.827	1.680	.147	
Taxes	.137	.183		.046
TOTAL COST	1.964	1.863	.101	
No. of Days Operated	296	260	36	
No. Shifts & Hours	25 1-8 hr.	6 1-8 hr.	19	
	23 2-8 hr.	254 2-8 hr.		231
	248 3-8 hr.		248	
Avg. Daily Product	2,192	1,984	208	

COST OF PRODUCTION:

	1941	%	1940	%	Increase		Decrease	
Labor	1.216	66.5	1.059	63.1	.156	3.4%		
Supplies	.611	33.5	.621	36.9			.010	3.4%
Total	1.827	100.0	1.680	100.0	.146			

b. Detailed Cost Comparison:

(1) Days and Shifts:

Year	Days Mine Worked	Shifts & Hours	Men Employed	Total Shifts Worked
1941	296	2 & 3 8-hr.	399	108,860
1940	260	1 & 2 8-hr.	357	87,896
Increase	36		42	20,964

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8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison: (Cont'd)

(2) Wages:

There was an increase of ten cents (10¢) per hour effective April 1, 1941.

(3) Comparison of Production:

Production - 1941	648,750 tons
Production - 1940	515,725 "
Increase	133,025 "

(4) Comparison of Number of Men and Wages:

	No. Men	No. Days	Amount	Rate Per Day
1941	399	108,860	780,886.82	7.17
1940	357	87,896	537,871.94	6.12
Increase	42	20,964	243,014.88	1.05

(5) Tons Per Man Per Day:

	1941	1940	Increase
Surface	33.84	31.13	2.71
Underground	7.23	7.23	
Total	5.96	5.87	.09

(6) Cost of Production:

	Total	Cost Per Ton
1941	1,184,767.68	1.826
1940	866,416.57	1.680
Increase	318,351.11	.146

	Labor	%	Supplies	%
1941	788,268.46	66.5	396,499.22	33.5
1940	546,290.43	63.1	320,126.14	36.9
Increase	241,978.03	3.4	76,373.08	
Decrease				3.4

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8. COST OF OPERATING: (Cont'd)

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

		1941		1940		Inc. or Dec.	
	Days Per Week	5		5			
	Shifts and Hours	2 & 3 8-hr.		1 & 2 8-hr.			
	Production - Tons	648,750		515,725		133,025	
	Avg. Daily Product - Tons	2,192		1,984		208	
	Number of Days Worked	296		260			
		Amount	Per Ton	Amount	Per Ton	Amount	Per Ton
	UNDERGROUND COSTS:						
1.	Exploring in Mine	171.32		228.62		57.30	
2.	Sinking in Shaft						
3.	Development in Rock	10862.06	.017	9613.07	.019	1248.99	.002
4.	Development in Ore	15488.39	.024	2863.63	.006	12624.76	.018
5.	Stoping	285666.23	.440	220240.02	.427	65426.21	.013
6.	Timbering	335547.46	.517	229476.32	.445	106071.14	.072
7.	Tramming	115877.15	.179	78339.27	.152	37537.88	.027
8.	Ventilation	7675.39	.012	5559.13	.011	2116.26	.001
9.	Pumping	28219.19	.043	28580.28	.055	361.09	.012
10.	Compressors & Air Pipes	55201.13	.085	48363.98	.094	6837.15	.009
11.	Fire & Damage	7593.45	.012			7593.45	.012
12.	Underground Superintendence	24481.27	.038	18314.64	.035	6166.63	.003
13.	Cave-in	328.95	.001			328.95	.001
14.	Maint: Compl & Power Drills	1890.94	.003	1199.51	.002	691.43	.001
15.	Scraper Equipment	23615.26	.036	16330.58	.032	7284.68	.004
16.	Elec. Tram Equipment	22774.81	.035	12442.79	.024	10332.02	.011
17.	Pumping Machinery	7179.81	.011	5694.02	.011	1485.79	.000
	Total Underground Costs	942572.81	1.453	677245.86	1.313	265326.95	.140
	SURFACE COSTS:						
18.	Hoisting	46200.56	.071	40392.26	.078	5808.30	.007
19.	Stocking Ore	8764.45	.014	9166.37	.018	401.92	.004
20.	Screening-Crushing at Mine						
21.	Dry House	8207.22	.013	6793.33	.013	1413.89	
22.	General Surface Expense	8110.50	.012	6839.95	.013	1270.55	.001
23.	Maint: Hoisting Equipment	18262.52	.028	10079.15	.020	8183.37	.008
24.	Shaft	4397.55	.007	4353.59	.009	43.96	.002
25.	Top Tram Equipment	3458.99	.005	2854.08	.006	604.91	.001
26.	Docks, Trestles & Pockects	1688.62	.003	1671.46	.003	17.16	
27.	Mine Buildings	6552.95	.010	3680.24	.007	2872.71	.003
	Total Surface Costs	105643.36	.163	85830.43	.167	19812.93	.004
	GENERAL MINE EXPENSES:						
27A.	Social Security Taxes	33877.34	.052	23444.26	.045	10433.08	.007
28.	Insurance	4900.14	.008	2930.82	.005	1969.32	.003
29.	Mining Engineering	2821.91	.004	3639.09	.007	817.18	.003
30.	Mech. & Elec. Engineering	2275.22	.004	1941.94	.004	333.28	
31.	Analysis and Grading	17185.49	.026	13581.27	.026	3604.22	
32.	Personal Injury	16815.60	.026	16190.80	.031	624.80	.005
33.	Safety Department	1855.70	.003	2034.78	.004	179.08	.001
34.	Telephones & Safety Devices	4547.09	.007	3425.64	.007	1121.45	
35.	Local and General Welfare	155.00				155.00	
36.	Spec. Exp., Pensions & Allow.	6640.21	.010	5714.27	.011	925.94	.001
37.	Ishpeming Office	11702.13	.018	10600.44	.021	1101.69	.003
38.	Employees Vacation Pay	17484.35	.027	6707.11	.013	10777.24	.014
39.	Mine Office	16999.49	.026	13312.89	.026	3686.60	
	Total General Mine Expenses	137259.67	.211	103523.31	.200	33028.20	.010
	COST OF PRODUCTION	1185475.84	1.827	866599.60	1.680	318168.08	.147
40.	Taxes	89081.27	.137	94100.95	.183	5019.68	.046
	TOTAL COST	1274557.11	1.964	960700.55	1.863	313148.40	.101

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8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison: (Cont'd)

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

1. Exploring in Mine:
Covers a proportion of Geological Department expense. Expense charged to Athens Mine decreased $57.30 and the cost per ton remained the same.

3. Development in Rock:
Total feet of drifting and raising in rock 888 ft. in 1941 as comparted with 1,234 ft. in 1940. Increase in expense $1248.99 and decrease in cost per ton $ .002. Increase in expense due to more drifting, higher wages and less raising. Drifting in 1941 - 835 ft., in 1940 - 704 ft. Raising in 1941 only 53 ft., in 1940 - 530 ft.

4. Development in Ore:
There were 668 ft. more ore drifting and 911 ft. more ore raising in 1941. The increase in expense was $12,624.76 and in cost per ton $ .018. Wages advanced 10¢ per hour on April 1, 1941.

5. Stoping:
The increase in expense was $65,426.21 and in cost per ton $ .013. Production increased 133,025 tons and wages were increased 10¢ per hour April 1, 1941. There was also more overtime paid due to operating two shifts on Saturdays the last half of the year.

6. Timbering:
The increase in expense was $106,071.14 and in cost per ton $ .072. The cost per ton for timber, lagging and poles decreased $ .0114, the increase in cost per ton was in labor due mainly to higher wages in 1941 and more shifts repairing timber. There was also more overtime shifts on repair work.

7. Tramming:
There was an increase in production of 133,025 tons due to more men employed and more shifts worked. The increase in expense was $37,537.88 and cost per ton $ .027. Ore was trammed on four levels in 1941 as compared with three in 1940 which increased the men employed on this work.

8. Ventilation:
The increase in expense was $2,116.26 and in cost per ton $ .001. The cost for electric power was $ 489.25 more than in 1940. There were two ventilation fans installed in the dry house and one in the engine house costing $451.38 and also installation expense. Repairs to ventilation fans and air doors also increased in 1941.

9. Pumping:
Expense decreased $361.09 and cost per ton $ .012. The cost for electric power was $654.88 more than in 1940. In part of May and June the Athens water was relayed and pumped through the Negaunee Mine while the Athens discharge line on surface was being relocated to remove it from the caved area South of the mine.

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8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison: (Cont'd)

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

9. Pumping: (Cont'd)

Year	Total Gallons Pumped	Gallons Per Minute
1941	185,835,174	354
1940	185,418,833	351
Increase	416,341	3

10. Compressors and Air Pipes:

Expenditures increased $6837.15 and cost per ton decreased $ .009.

Cu. ft. air compressed - 1941	1,350,945,000
Cu. ft. air compressed - 1940	1,196,505,000
Increase	154,440,000

Electric Power Cost - 1941	$ 41,160.41
Electric Power Cost - 1940	37,466.57
Increase	3,693.84

More air used account of more working days and operating compressor on a third shift. The expense to air lines also increased due to more operating time and extending air lines on levels. Extension of air lines on the 4th level was a big factor in increase in cost.

11. Fire and Damage:
Expense in 1941 was $ 7,593.45, cost per ton $ .012. None in 1940. This expense was incurred in extinguishing the fire in the mine in the month of July at which time the mine was idle from July 2nd to July 17th.

12. Underground Superintendence:
The increase in expense was $6,166.63 and cost per ton $ .003. Increase due to adding an underground foreman and two shift bosses during the year. There was also an increase in amount paid for safety bonus due to more men working and an increase of 10¢ per hour in wages.

13. Cave-in:
Expense in 1941 $328.95, cost per ton $ .001. None in 1940. Expense in 1941 was for digging test pit to determine if the ledge was broken on the line of the new break to surface near the South side of the Athens property. Some expense was also incurred for fencing beyond the new break to surface.

14. Compressors and Power Drills:
The increase in expense was $691.43 and cost per ton $ .001. There were four new RB-12 drill machines and four Ingersoll-Rand Jacklegs bought while in 1940 no drill machines or jacklegs were purchased. There were also less repairs to compressors in 1941.

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8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison: (Cont'd)

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

15. Scraper Equipment:
The expense in 1941 increased $7,284.68 and cost per ton $ .004. There was one new 15 H.P. Sullivan electric scraper hoist and three Holcomb scrapers bought in 1941. None in 1940. Electric power increased $489.25 and there were more repairs to scrapers and scraper hoists due to larger product and the mine operating more shifts in 1941.

16. Electric Tram Equipment:
The increase in expense was $10,332.02 and cost per ton $ .011.

	1941	1940	Increase	Decrease
Generators	1797.03	1136.91	660.12	
Locomotives	9087.65	2714.85	6372.80	
Wiring	2601.92	1536.47	1065.45	
Main Line Tracks	7271.81	4210.09	3061.72	
Main Line Cars	2016.40	2844.47		828.07

Increase in expense to generators due to purchasing a second hand generator from the Gardner-Mackinaw Mine, cost $700.00. On October 30th one generator set was burnt and a new one has been ordered but has not yet been received.

Increase in locomotives due to more repairs and increase in wages. Increase in wiring due to extending and repairing trolley lines. Increase in main line tracks due to extending tracks on the 4th level and repairing. Decrease in main line cars due to less repairing and overhauling. In 1941 only one car was overhauled while in 1940 eight were overhauled at the General Shops.

17. Pumping Machinery:
Expenditures increased $1,485.79 while the cost per ton remained the same. Increase in expense due to charging out expense incurred in E. & A. No. AM-5 - "Surface Discharge Line" - $3,960.14. In 1940, 508 ft. of 10" discharge pipe in the shaft was replaced at a cost of $2,559.33. The repairs to pumps were about the same in both years.

SURFACE COSTS:

18. Hoisting:
Ore and rock hoisted during 1941 and 1940 was as follows:

Year	Ore	Rock	Total
1941	648,750	20,630	669,380
1940	515,725	11,782	527,507
Increase	133,025	8,848	141,873

Expenditures increased $5,808.30 while cost per ton decreased $.007. The cost per ton for electric power was $ .0536 as compared with $ .061 in 1940. The increase in expense was due to hoisting a larger product and working more shifts and increase in wages on April 1st.

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8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison: (Cont'd)

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

19. Stocking Ore:

Tons Stocked in 1941	228,122
Tons Stocked in 1940	238,029
Decrease	9,907

The decrease in expense was $401.92 and in cost per ton $ .004. The decrease in expense was due to less tons stocked on account of earlier opening of shipping season. There was also less expense erecting wood stocking trestles.

21. Dry House Expense:
Expenditures increased $1,413.89 while the cost per ton remained the same. The increase in expense was due to working more shifts and increase of 10¢ per hour in wages effective April 1, 1941.

22. General Surface Expense:
Expense increased $1,270.55 and cost per ton decreased $ .001. The increase in expense was due to more operating shifts and an increase of 10¢ per hour in wages effective April 1, 1941

23. Hoisting Equipment:

	1941	1940	Increase	Decrease
Electric Hoists	7618.15	2179.14	5439.01	
Ropes	4512.22	3178.40	1333.82	
Skips & Roads	5320.68	3845.36	1475.32	
Sheaves	811.47	876.25		64.78

The expenditures increased $8,183.37 and cost per ton $ .008. During the year a new control was installed on the skip hoist at a cost of $3,388.27 and the old Lily hoist control was replaced with a new one costing $855.00 and installation expense also charged to this account. In 1941 there were two 1-3/8" skip ropes costing $3,986.34 and part of a skip rope $525.88, also a 1-1/4" cage rope costing $1,201.11. In 1940 two skip ropes and part cost of a third skip rope but no cage rope. The increase in expenditures for skips and skip roads was due to more repairs to skips and replacing shaft runners in skip roads. Decrease in expense for sheaves due to less replacements.

24. Shaft:

	1941	1940	Increase	Decrease
Steel Sets	1181.90	1357.08		175.18
Casing & Guniting	-	2214.61		2214.61
Undg. Pockets	3215.65	781.90	2433.75	

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8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison: (Cont'd)

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

24. Shaft: (Cont'd)

Decrease in expense to steel sets due to replacing broken sets in circular shaft in 1940. This also made it necessary to case and gunite the shaft where the new sets were put in and accounts for the decrease in expenditures for casing and guniting. The increase in expenditures to underground pockets was due to more repairs to main level pockets and skip pit pocket at bottom of the shaft.

25. Top Tram Equipment:

There was an increase in expense to this account of $604.91 and a decrease of $ .001 in cost per ton.

	1941	1940	Increase	Decrease
Engines & Motors	121.75	163.63		41.88
Wire Rope	1299.31	1080.40	218.91	
Sheaves, Rollers, Etc.	700.94	504.83	196.11	
Tracks & Cars	1336.99	1104.68	232.31	

The increase in expense for wire rope was due to more top tram rope used in replacements in 1941. The expense to sheaves, rollers, etc. increased due to more replacements of sheaves and rollers. The increase in expenditures for tracks and cars was due to rebuilding a top tram car.

26. Docks, Trestles, and Pockets:

The increase in expenditures was $17.16 while the cost per ton remained the same. There were more repairs to skip dump in shaft house and surface ore pockets which was offset by the expense in 1941 of erecting a new wood trestle for stocking rock.

27. Mine Buildings:

1941

Building	Amount	Remarks
Office	313.81	Plastering and decorating.
Shops	360.08	New doors, repairs to windows & brick work.
Shaft House	15.53	
Engine House	576.52	New windows, painting & repair brick work.
Heating Plant Bldg.	10.04	Repairs to windows.
Dry House	5161.07	Addition and remodeling.
Coal Dock	9.15	Repair bracing.
Timber Tunnel	34.00	Repairs to doors.
Storage Bldg.	72.75	Moving partition & change doors.
Total	6552.95	

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8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison: (Cont'd)

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

27. Mine Buildings: (Cont'd)

1 9 4 0

Building	Amount	Remarks
Office	22.70	Repair front porch and steps.
Shops	24.17	Repair windows and doors.
Shaft House	15.16	Repair windows.
Engine House	236.62	Replacing windows and window frames.
Heating Plant Bldg.	29.21	Repair roof.
Dry House	2691.95	Make first aid room and remodeling.
Timber Tunnel	371.51	Repair sheet iron covering & frame.
Storage Bldg.	263.54	New roofing.
Top Tram Bldg.	25.38	Repair roof.
Total	3680.24	

The expenditures increased $2,872.71 and the cost per ton $ .003.

GENERAL MINE EXPENSE:

27A. Social Security Taxes:

	1941	1940	Increase
Unemployment Insurance Tax	25998.88	17992.16	8006.72
Old Age Benefit Tax	7878.46	5452.10	2426.36

The increase in expense was $10,433.08 and cost per ton $ .007. The expense in this account is based on the amount of the payrolls. The unemployment insurance tax was 3% and the old age benefit tax 1% in both 1941 and 1940. The increase in expenditures was due to larger payrolls account of mine operating more shifts and more men employed, also more overtime paid.

28. Insurance:

	1941	1940	Increase
Property	2254.97	2105.58	1505.11
Group	2105.58	1814.24	291.34
Catastrophe	538.25	366.72	171.53

The expense to this account increased $1,967.98 and cost per ton $ .003.

29. Mining Engineering:

Covers time and expense of mining engineers and helpers. The cost was less in 1941 due to time of superintendent's assistant charged to this account for several months in 1940. The expense to this account decreased $817.18 and cost per ton $ .003.

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8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison: (Cont'd)

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

30. Mechanical and Electrical Engineering:

The increase in expense to this account was $333.28 and cost per ton remained the same. The charge to this account covers the time spent by Mechanical and Electrical Department men on inspections and repairs.

31. Analysis and Grading:

	1941	1940	Increase
Sampling at Mine	4660.17	2893.69	1766.48
Central Laboratory Expense	8876.55	7435.99	1440.56
Shipping Department Expense	2991.13	2710.04	281.09
Trucking Samples, etc.	657.64	541.55	116.09
Determinations - 1941		27,572	
Determinations - 1940		25,567	
Cost Per Determination - 1941		.321941	
Cost Per Determination - 1940		.290843	

The increase in expenditures to this account was $3,604.23 while the cost per ton remained the same. The increase in expense was due to more ore shipped from stockpiles and pockets and to increase in wages.

32. Personal Injury:

	1941	1940	Increase	Decrease
Compensation & Doctors	10510.17	10616.66	106.49	106.49
Compensation Dept.	744.41	764.78		20.37
Hospital Loss	5561.02	4809.36	751.66	

There was an increase in expense to this account of $624.80 and the cost per ton decreased $ .005.

33. Safety Department:

	1941	1940	Increase	Decrease
First Aid Supplies	243.50	233.54	9.96	
First Aid and Helmet Practice	81.10	63.51	17.59	
Ishpeming Office Charge	1531.10	1737.73		206.63

The expense to this account decreased $179.08 and cost per ton $ .001.

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8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison: (Cont'd)

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

34. Telephones and Safety Devices:

Expenditures to this account increased $1,121.45 while the cost per ton remained the same.

	1941	1940	Increase	Decrease
Lights at Shaft and Levels	3951.27	3054.87	896.40	
Mine Telephones	227.80	236.59		8.79
Safety Gates	231.14	99.32	131.82	
Signs and Signals	91.71	19.78	71.93	
Fire Equipment	45.17	15.08	30.09	

The increase in expense for lights at shaft and on levels was due to mine operating more shifts and reopening the 4th level.

35. Local and General Welfare:

The expense to this account was $155.00, none in 1940.

36. Special Expense, Pensions and Allowances:

	1941	1940	Increase	Decrease
Legal	362.85	419.81		56.96
Saranac Investigation	2278.36	2464.00		185.64
Curtailment	7.75	15.81		8.06
Retirement	1355.84	1189.24	166.60	
Other	2635.41	1625.41	1010.00	

There was an increase in expenditures of $925.94 and a decrease in cost per ton of $ .001.

37. Ishpeming Office:

Ishpeming office expense is prorated to various mines on basis of labor. There was an increase in expense of $1,101.69 and the cost per ton decreased $ .003.

38. Employees Vacation Pay:

The expense to this account increased $10,777.24 and cost per ton $ .014. In 1941 employees with three years service received one weeks vacation pay and those with fifteen or more years service received two weeks vacation pay.

39. Mine Office:

	1941	1940	Increase
Salaries	12340.20	9616.85	2723.35
Central Warehouse Expense	3360.29	2862.09	498.20
Miscellaneous	1299.00	833.95	465.05

The increase in expenditures was $3,686.60 and the cost per ton remained the same. There was a 10¢ per hour increase in salaries effective April 1, 1941. A proportion of the Assistant Superintendent's salary was added for the year and an extra clerk was put on July 15, 1941.

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8. COST OF OPERATING: (Cont'd)

b. Detailed Cost Comparison: (Cont'd)

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

40. Taxes:

There was a decrease in taxes levied of $5,019.68 and the cost per ton decreased $ .046. Decrease in taxes due to lower tax rate and in cost per ton due to larger product.

9. EXPLORATIONS AND FUTURE EXPLORATIONS:

There was no diamond drilling on the Athens property in 1941 and no explorations are under consideration at this time.

10. TAXES:

A comparison of assessed valuation and taxes for 1941 and 1940 follows:

	1941		1940	
	Valuation	Taxes	Valuation	Taxes
Realty (Tax Commission)	2,155,000	71,564.97	1,750,000	61,390.18
Ore in Stock, Equipt. & Supp.	495,000	16,438.36	900,000	31,572.09
Total by Tax Commission	2,650,000	88,003.33	2,650,000	92,962.27
Sterling Addition	4,600	152.77	4,600	161.38
Harvey Plat	1,300	43.18	1,300	45.61
Total	2,655,900	88,199.28	2,655,900	93,169.26
Collection Fees		881.99		931.69
Total Optg. Athens Mine	2,655,900	89,081.27	2,655,900	94,100.95
Rented Buildings:				
Harvey Plat	4,700	156.11	4,700	162.90
Sterling Addition	22,800	757.25	22,800	801.93
Total	27,500	913.36	27,500	964.83
Collection Fees		9.13		9.65
Total Athens Rented Bldgs.	27,500	922.49	27,500	974.48
Total Athens Iron Mining Co.	2,683,400	90,003.76	2,683,400	95,075.43
Total Taxes City of Negaunee		483,960.09		517,964.88
Tax Rate Per $100 Valuation		3.32088		3.50801
Athens Iron Mining Co. % of City Taxes		18.59%		18.3%

The total taxes assessed in the City of Negaunee decreased $34,004.79 and the tax rate per $100 valuation $ 0.28713. Taxes assessed the Athens Iron Mining Company decreased $5,071.67 in 1941. The valuation by the State Tax Commission has remained the same for the past three years.

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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:

	1941	1940	1939	1938	1937	1936
Fatal	0	1	0	1	0	0
Time lost - Over 4 months	1	1	0	1	1	3
- 1 to 4 months	7	4	5	3	5	3
- Less than 1 month	10	5	3	1	1	1
Total Accidents	18	11	8	6	7	7
Number of cases paid compensation for accidents prior to Jan. 1st of each year	4	4	5	7	7	6
Number of cases paid difference in wages (included in above total)	2	3	2	3	3	3

Nature and Classification of Compensable Accidents:

Date		Days Lost
1/21/41	Fracture, right leg	53
1/29/41	Fracture, bone left foot	54
2/7/41	Infected wound, left foot	32
3/20/41	Fracture bone right foot	21
4/10/41	Bruised right thigh and leg	7
4/10/41	Ruptured right arm muscles	7
4/16/41	Infected bursitis	21
5/4/41	Abrasion left eye	5
5/12/41	Fracture right hip	Home
5/16/41	Sprained muscles calf left leg	25
5/21/41	Infected left foot	31
6/27/41	Fracture right great toe	30
8/15/41	Right inguinal hernia	49
8/27/41	Bruised right foot	5
9/9/41	Bruised left leg	4
9/30/41	Fractured bone left foot	27
11/5/41	Contused chest and back	8
12/18/41	Bruised right knee and leg	8

There were 18 compensable accidents in 1941 as compared with 11 in 1940. The accident severity rate per 1,000 man days worked in 1941 was 5.34 as compared with 24.57 in 1940 in which year there was one fatal accident. In 13 years or the period from 1929 to 1941 inclusive, there were 3 fatal accidents, one complete disability, and 71 other compensable accidents. There were more days worked in 1941 than in any other year in the 13 years period. The average severity rate for the 13 years period was 17.40. In only four of the 13 years was the severity rate lower than in 1941.

11. ACCIDENTS AND PERSONAL INJURY: (Cont'd)

In view of the heavy crushing in the Athens Mine, the soft, slabby character of the ore, and the heavy operating schedule during 1941, the accident record was not bad but there still is much room for improvement. More shift bosses were added in 1941, also an underground foreman to assist the Captain in order to insure stricter discipline and closer supervision. Eternal vigilance is the only safeguard against accidents and this applies to both the supervisors and the men. Most of the accidents are due to carelessness on the part of the injured man, often termed the wrong method of doing the work.

Meetings of the shift bosses, Captains, and Superintendents were held several times at the mines in the Negaunee District and general meetings at the General Office at Ishpeming for all the mines for discussion of the accidents, safety rules and the mining standards. These meetings keep the bosses alive to the necessity of maintaining a close watch to detect unsafe practices and violations of the safety rules and regulations.

12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION:

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

E. & A. No. AM-1 - Remodeling Change House

Estimated Expenditure	Expended 1941	Expended 1940	Expended To Date	Unexpended Balance
12,981.25	8,042.15	5,933.52	13975.67	994.42

This E. & A. authorized in March 1940 and completed in 1941. Expenditures exceeded the amount authorized due to changes made as the work progressed and higher wages paid after April 1, 1941.

E. & A. No. AM-2 - Skip Hoist Control

3,000.00	3,388.27	3,388.27	388.27

This E. & A. authorized and completed in 1941. Expenditures exceeded the estimate due to more labor cost account of difficulty in adjusting the control.

E. & A. No. AM-3 - Ford Dump Truck

990.27	1,180.27	1,180.27	190.00

This E. & A. authorized and completed in 1941. Expenditures exceeded the amount authorized due to change from dump box to platform dump.

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION: (Cont'd)

	Estimated Expenditures	Expended 1941	Expended 1940	Expended To Date	Unexpended Balance
E. & A. No. AM-5 - Surface Discharge Line	4,460.81	3,960.14		3,960.14	500.64

The relocation of discharge line was made with less labor cost and less pipe than was estimated. Open ditch replaced several hundred feet of pipe. This E. & A. was authorized and completed in 1941.

E. & A. No. AM-6 - Ventilation Equipment	7,755.00	924.19		924.19	6,830.81

This authorization covers cost and installation of new fan on the 10th level. Work started in December 1941.

E. & A. No. AM-7 - Motor Generator Set of Underground:

No expense in 1941. New generator on order will be installed in 1942 in pumphouse on 10th level to replace old set that burned beyond repair in 1941.

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 by The Athens Iron Mining Company.

b. Scraper Hoists:

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

	On Hand 1/1/1941	Purchased 1941	Total on Hand 12/31/41	Repair Cost Per Machine 1941	Repair Cost Per Machine 1940
Sull. 15 H.P. Elec.	17	1	18	159.28	66.71
" 20 H.P. "	2	-	2	214.50	116.45
" 25 H.P. "	1	-	1	-	-
I-R. 15 H.P. "	6	-	6	115.41	72.18
20 H.P. "	7	-	7	26.23	35.65
Total	33	1	34	122.71	72.49

One scraper hoist was purchased in 1941, a 15 H.P. unit with continuous rated motor and 300 ft. rope speed. The cost per machine for repairs was much higher in 1941 due to harder service account of operating more shifts and to greater age of a number of the hoists. It is estimated that two scraper hoists with 20 H.P. continuous rated motors and 300 ft. rope speed will be purchased in 1942.

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13. EQUIPMENT AND PROPOSED EQUIPMENT: (Cont'd)

c. Drill Machines:

In 1941 four RB-12 jackhamer machines and four Ingersoll-Rand jacklegs were purchased and charged directly to operating cost. In 1942 it is estimated that six RB-12 drill machines and four jacklegs will be purchased.

d. Motor Haulage: Cars:

No motor cars were purchased in 1941.

e. Timber Hoists:

Several four cylinder air powered timber hoists were purchased in 1941 at a cost of $475.00 each and at least four more will be required in 1942. These hoists are replacing the old low powered timber hoists bought fifteen to twenty years ago.

14. MAINTENANCE AND REPAIRS:

a. Steel Trestles:

No repairs were made to the steel trestles in 1941. The 4" x 6" decking timber that was treated in 1940 and which it was planned to install in 1941 will be installed in 1942.

b. Comparison of Costs - 1941 with 1940:

Maintenance and repairs listed under underground costs:

	Amount	Cost Per Ton
1941	55,460.82	.085
1940	35,666.90	.069
Increase	19,793.92	.016

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

	1941	1940	Increase
Comp. & Power Drills	1,890.94	1,199.51	691.43
Scraper Equipment	23,615.26	16,330.58	7,284.68
Elec. Tram Equipt.	22,774.81	12,442.79	10,332.02
Pumping Machinery	7,179.81	5,694.02	1,485.79
Total	55,460.82	35,666.90	19,793.92

Expense for maintenance of compressors and power drills increased due to purchase of four RB-12 auger drills and four jacklegs in 1941 while none were purchased in 1940.

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14. MAINTENANCE AND REPAIRS: (Cont'd)

b. Comparison of Costs - 1941 with 1940: (Cont'd)

Expense for scraper equipment increased due to purchase of one new 15 H.P. scraper hoist and three Holcomb scrapers in 1941, none were purchased in 1940. On account of the heavy operating schedule more repairs were required to scraper hoists and scrapers. The expense for rope was greater in 1941 as 75,519 ft. were used as compared with 57,320 ft. in the previous year.

Expense for electric tram equipment was much higher in 1941. One second hand generator costing $700.00 was purchased in 1941. Repairs to locomotives was much greater due to more ore trammed and higher wages and more overtime shifts on repairs. The opening of the 4th level for ore production increased the expense for trolley wire and for haulage tracks. Supplies used on tracks comprised new 40-lb. rail, frogs and switches, ties, tie plates, steel ties, spikes and rail bonds.

Expense for pumping machinery was high in both 1941 and 1940 due to extraordinary expense incurred in each year. In 1941 the surface discharge line was relocated on account of the break of the ledge at surface across the old discharge ditch. In the new location the water is carried over 1,500 ft. in 10" spiral riveted pipe 2 ft. or more beneath the surface and then 1,500 ft. in an open ditch. In 1940, 508 ft. of new extra heavy 10" discharge line was installed in the shaft replacing a like footage that was leaking due to rusting.

Maintenance and repairs listed under surface costs:

	Amount	Cost Per Ton
1941	34,360.63	.053
1940	22,638.52	.045
Increase	11,722.11	.008

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

	1941	1940	Increase
Hoisting Equipment	18,262.52	10,079.15	8,183.37
Shaft	4,397.55	4,353.59	43.96
Top Tram Equipment	3,458.99	2,854.08	604.91
Docks, Trestles, & Pockets	1,688.62	1,671.46	17.16
Mine Buildings	6,552.95	3,680.24	2,872.71
Total	34,360.63	22,638.52	11,722.11

Maintenance expense listed under "Surface Costs" was 50% higher in 1941 but the increase in cost per ton was only 18% due to larger product.

Expense for hoisting equipment amounted for the major part of the increase. Am amplydine control was installed on the skip hoist at a cost of $3,388.27 and a new Lily control replaced the old Lily control at a cost of $855.00. In 1941, two skip ropes and cage rope installed at a cost of $5,713.33 as compared with two skip ropes costing $3,178.40 in 1940. The heavy operating schedule made bi-weekly inspection of the skip roads necessary and also increased the amount of repairs required to keep the skip roads in safe operating condition.

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14. MAINTENANCE AND REPAIRS: (Cont'd)

b. Comparison of Costs - 1941 with 1940: (Cont'd)

The expense for maintenance of the shaft was practically the same as in 1940. The unusual expense incurred in 1940 of $2,214.61 for casing and guniting due to rusting out of the wire fencing used for casing off the ladder road from the cage road. Gunite was used on the skip road side of the cage road where a tight seal is maintained to prevent the air exhausted from the mine from by-passing into the downcast airway. The seal was broken at several places where the steel dividers in the circular shaft were broken and had to be replaced.

The unusual expense in 1941 was in the sub account "Underground Pockets". The concrete fronts of the transfer raises on the 10th level plat were pushed out by a sudden rush of wet ore and had to be torn out and replaced. One of the concrete dividing walls between compartments in the 10th level pocket was also broken at this time and also had to be replaced.

The expense for top tram equipment increased slightly in 1941 due entirely to more replacements and repairs necessary account of the mine operating more shifts.

Expense incurred in the account "Docks, Trestles, and Pockets" was practically the same as in 1940. The expense in 1940 of erecting a wood trestle for dumping rock was offset in 1941 by more repairs required to the skip dump in the shaft house, and to replacement of plates in the shaft house pockets.

The expense for repairs, etc., to mine buildings increased $2,872.71 in 1941, Practically all of which was due to expense incurred at the dry house. A proportion of the expenditures under E. & A. AM-1 was charged out, also all of E. & A. AM-4 - Repairs to Dry House Roof.

There was some expense incurred for redecorating the interior of the mine office building and for new and larger doors at each end of the shop building and for new windows and other repairs to the engine house.

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15. POWER:

Detail of electric current purchased compared with 1940:

	1941 - 12 Mos. Optg.		1940 - 12 Mos. Optg.	
	Cost	Per Ton	Cost	Per Ton
Stoping	2,451.63	.004	1,850.01	.004
Ventilation	3,735.38	.006	3,246.13	.006
Pumping	20,860.03	.032	21,767.46	.042
Hoisting	34,794.31	.054	31,227.20	.060
Stocking Ore	855.41	.001	947.86	.002
Dry House	242.97		151.26	
Lights at Levels	2,562.39	.004	1,985.01	.004
Compressor	41,160.41	.063	37,466.57	.073
Electric Haulage	3,853.03	.006	2,882.67	.006
Shops	603.85	.001	334.22	.001
Heating Plant	16.35		16.80	
Office	23.60		18.96	
Storage Battery Loco.	35.49		34.19	
Total	111,194.85	.171	101,928.34	.198

Main Line Meter - K.W.	8,312,932	7,349,247
Separate Meter Readings	8,175,166	7,287,031
Line Loss	137,766	62,216
Product	648,750	515,725
K.W. Per Ton (Inc. Line Loss)	12.81	14.25
Cost Per K.W. (Avg.)	.0133761	.0138692
15 Min. Demand (Avg.)	1528	1513
Load Factor (Avg.)	61%	54%

The cost per ton for electric power decreased $ .027 in 1941 due to a more favorable load factor. The total cost for current increased only $9,166.51 while the product increased 133,025 tons.

17. CONDITION OF PREMISES:

a. Grounds:

The grounds at the mine were kept in good condition during the year. The extension of the cave to surface on the West side of the timber yard has already decreased the area for storage of timber and if the cave continues it will in time make a revamping of the timber storage yard imperative. If an uninterrupted flow of timber, lagging, and poles by truck was assured, no trouble will arise even if the storage area is materially reduced, but this is impossible during the duration of the war on account of the rubber shortage.

b. Athens Mine Houses:

The following statement gives the total cost of repairs and the average cost per house for 1941 and 1940:

Year	No. Houses	Amount	Avg. Cost Per House	Rental Income
1941	30	3,830.69	127.69	4,884.80
1940	31	4,775.30	154.04	4,881.95

ATHENS MINE
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17. CONDITION OF PREMISES: (Cont'd)

b. Athens Mine Houses: (Cont'd)

Athens house No. 4 was sold in 1941. This was an old log house located on the line of the break to surface near the South line of the Athens property. The house was not worth moving to a new location and it was accordingly sold and dismantled. Repairs to the thirty houses in 1941 covered exterior repairs and painting of five houses, new chimneys, hardwood floors, and several new one- and two-car garages.

In the past ten years the houses have all been repaired and painted, nearly all the old cow and horse barns dismantled and replaced with modern garages. Toilets have also been installed in every house and new foundations under several houses. Repairs will be much lighter in future years.

18. NATIONALITY OF EMPLOYEES:

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

As to Parentage	1941	%	1940	%
English	59	14.8	49	13.7
Finnish	175	43.8	165	46.2
Italian	69	17.3	64	17.9
Swedish	31	7.8	25	7.0
French (France)	1	.2	1	.3
French (Canadian)	35	8.8	30	8.4
Scotch	2	.5	1	.3
German	3	.8	2	.6
Austrian	6	1.5	6	1.7
Norwegian	7	1.8	8	2.2
Irish	4	1.0	1	.3
Greek	1	.2	1	.3
Danish	2	.5	3	.8
Polish	1	.2	1	.3
Jugoslavian	3	.8		
Total	399	100.0	357	100.0

As to Birth	American Born		Foreign Born	
	1941	1940	1941	1940
English	46	36	13	13
Finnish	119	107	56	58
Italian	31	27	38	37
Swedish	26	20	5	5
French (France)	1	1		
French (Canadian)	34	30	1	
Scotch	2	1		
German	3	2		
Austrian	4	5	2	1
Norwegian	7	8		
Irish	4	1		
Greek			1	1
Danish	2	3		
Polish	1	1		
Jugoslavian	3			
Total	283	242	116	115

JACKSON LEASE-CAMBRIA MINE
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1. GENERAL

The Jackson Lease has been very active during the year and has developed a very large tonnage of high grade ore. It has now been fairly well established that the ore heretofore called the East and Center Deposits are one and the same ore body joining together just under the Sixth Level to form one large ore body and, furthermore, that the top of the ore flattens out to the south, underneath the level, and again rises to a considerable height above the Sixth Level. From present developments we know that at one point this riser extends over 300 feet above the level.

One unfavorable fact has been noted this year, and that is that the lower portion of the ore body is high in sulphur. This transition point seems to be 55 feet above the Seventh Level, and since high sulphur is usually laid down in a horizontal plane, it is reasonable to assume that all the ore from a level 55 feet above the Seventh Level, down, will be high sulphur ore. The average analysis of this ore so far encountered will run somewhere between .2 and .3% in Sulphur.

In March, the operating personnel was changed. Captain J. H. Davey was replaced by Captain John H. Annear and Ed. Anderson, the engineer, was replaced by Julius Siren. Both of these men were transferred from the Gogebic Range, and on their arrival, they immediately started developing to establish the Gogebic System of mining. As soon as The Cleveland-Cliffs Iron Company were aware of this fact, they put up a very strong protest. After several months of controversy, it was brought to a head when in August the officials of the Republic Steel Corporation and The Cleveland-Cliffs Iron Company went underground and visited the two working places where the Gogebic System was being used. Representing the Republic Steel Corporation were Mr. R. J. Wysor, President; C. M. White, Vice President; C. A. Ilgenfritz, Manager of Purchases; John H. Annear, Captain; and Julius Siren, Engineer. The Cleveland-Cliffs Iron Company was represented by Mr. S. R. Elliott, Manager; W. W. Graff, Superintendent of the Negaunee District, and me. After considerable argument, pro and con, it was agreed that the Gogebic System of mining shall be used in the Jackson Lease to a depth of 60 feet below the Sixth Level, and that if after mining to this depth, the system proves unsatisfactory, it would be changed to top slicing.

In October, Mr. Julius Siren was promoted to Assistant Superintendent, a position he held for about a month when he lost his life while performing his duties on an accident investigating committee.

There were two fatal accidents in the Jackson Lease during the year; both occurring on the same date and in the same raise. The first one, which occurred at 7:30 A.M. was that of William Johnson, one of the miners who was putting up a raise. These men were getting ready to hoist timber from the main level to a sub-level which takes off from the raise 100 feet above the main level and about 70 feet down from the top of the raise. The safety doors in the raise were open preparatory to hoisting when they found that the air valve, which was located in the raise about 20 feet above the sub-level floor, was making so much noise that they could not hear their signals, so Johnson went up to close the valve. It was at this point that he passed out from deficiency of oxygen in the air and fell all the way to the main level, being killed instantly.

JACKSON LEASE-CAMBRIA MINE
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1. GENERAL (CONT)

The second accident occurred less than three hours later when the Safety Committee came down to investigate the first one. The committee climbed up to the sub-level and closed the door over the raise. Julius Siren, assistant superintendent, a member of the committee, went up the raise to locate the valve which the first victim went up to close. He had taken the measurement, relayed it down to the committee and was winding up the tape when he shouted, "Look Out" as he fell head first, landing on the safety door at the sub-level. He was taken to the hospital where he died about three hours later. It was the opinion of the remaining committee members that he slipped on the ladder while he was winding up the tape.

2. PRODUCTION
SHIPMENTS &
INVENTORIES

a. Production by Grades

Grade	Tons	% of Product
Cambria (Non-Bessemer)	123,698	100
Violet (Bessemer)	0	0
Total	123,698	100

The production from the property since the lease became operative is as follows:

Grade	1941 Tons	1940 Tons	1939 Tons	1938 Tons	1937 Tons	1936 Tons	Total Tons
Cambria (Non-Bessemer)	123,698	92,669	62,036	21,663	66,116	7,791	373,973

b. Shipments

Grade of Ore	Pocket Tons	Stockpile Tons	Total Tons	Total Last Year
Cambria (Non-Bessemer)	75,144	49,826	124,970	91,690

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	2,324	66,667	64,343
1937	61,008	100,000	38,992
1938	0	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
Total	359,945	566,667	206,722

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2. PRODUCTION
SHIPMENTS &
INVENTORIES (CONT)

c. Stockpile Inventories

Grade of Ore	Dec. 31st 1941	Dec. 31st 1940	Decrease
Cambria (Non-Bessemer)	14,318	15,590	1,272

e. Production by Months

Month	Cambria Ore Tons	Rock Tons
January	9,818	343
February	8,039	103
March	9,440	360
April	12,838	463
May	9,309	214
June	12,106	418
July	11,743	150
August	9,406	19
September	11,289	47
October	8,995	197
November	10,439	630
December	10,276	263
Totals	123,698	3,207

3. ANALYSES

The following are the analyses of the Cambria Ore produced from the Jackson Lease during 1941. These figures are compiled from the average analysis of the product from each day's operation. It will be noted that the statement does not show the silica and moisture content for the first three months which is due to the fact that these were not asked for until the first of April and therefore were not reported to me. 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	4,178	56.84	.100	---	---
February	"	3,421	56.03	.083	---	---
March	"	4,017	57.59	.095	---	---
April	"	5,052	58.48	.084	9.70	11.27
May	"	4,125	59.05	.087	9.36	11.62
June	"	5,158	59.33	.071	9.47	11.52
July	"	5,006	58.00	.067	10.87	11.32
August	"	4,069	58.00	.069	10.34	11.67
September	"	4,651	57.48	.078	11.23	14.07
October	"	3,858	57.11	.083	11.91	17.22
November	"	4,455	58.89	.082	9.47	16.12
December	"	4,389	58.33	.076	9.92	16.31
Total		52,379	58.00	.081	10.23	13.34

JACKSON LEASE-CAMBRIA MINE
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3. ANALYSES (CONT)

The following statement shows the sulphur analyses of ore that was hoisted from the Seventh Level during the time that development operations were in progress in the ore between the Sixth and Seventh Levels where the sulphur content was an unknown factor.

Month	Grade	Cars	Dried Sulphur
February	Cambria	858	.112
March	"	1,132	.018
April	"	1,073	.017
May	"	784	.017
June	"	283	.019
July	"	818	.042
August	"	699	.033
Total		5,647	.037

6. SURFACE

Shipments from stockpile started in April and the entire pile was loaded out except for a small tonnage of wet ore (too wet to be shipped from pocket) which was hoisted near the close of the season and put in stock to dry out. The customary stocking trestles were erected.

7. UNDERGROUND

a. General

The average monthly production was 10,308 tons as compared to 7,722 tons in 1940 and represents an increase of 33.49%. This increase was due to a 40.33% increase in working time.

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	68	17.81	8.11
February	72	16.38	6.82
March	73	15.23	8.49
April	74	16.73	9.59
May	76	15.11	8.44
June	74	16.22	10.10
July	72	17.38	9.40
August	73	16.74	7.82
September	72	16.88	8.99
October	74	16.29	7.32
November	63	16.88	9.84
December	72	15.22	9.41
Monthly Average	71.92	16.41	8.69
Monthly Avg. 1940	51.25	14.70	10.24

The decrease in tons per miner per 8 hour shift, as shown in the foregoing table is due to the fact that considerable more rock was broken, less stoping and more development work was done this year as compared with 1940.

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7. UNDERGROUND

b. Development

Developments this year have proven that the ore areas previously referred to as the East and Center Deposits, are one and the same ore body and henceforth will be called the Main Deposit.

The ore located by the last 55 feet of Diamond Drill Hole No. 122 on the Sixth Level has been fully developed and proved to be a riser from the extreme East end of the Main Deposit, extending approximately 40' above the level. The area of this ore at the elevation of the Sixth Level is about 12,000 square feet, being 170 feet in length and averaging 70 feet in width.

During the latter part of February and the early part of March, Diamond Drill Hole No. 129 was drilled southerly from a point 150' South and 3585' East. This hole, 104' long, showed ore from 45' to 60' then went through 10' of dike and continued in ore to the end. On completion of this hole, the main haulage drift was advanced southerly 95', going through two ten-foot dikes with 20' of ore between them, and encountered jasper south of the most southerly dike. The haulage drift was then extended 345' Westerly and southwesterly between the two dikes. Two raises were put up from this drift, one from a point 235' South and 3413' East and the other from 308' South and 3382' East. The first, or most easterly raise is now up 275' above the Sixth Level and is still in high grade ore. From this raise, sub-levels were cut out at elevations +153', +198' and +290.7'.

On the 150' and 200' Subs, the ore was cross-cut North and South from the raise, showing an average width of 60' of high grade ore. Also on each of these Subs a drift was driven southwesterly from the raise, 145' on the 150' Sub and 140' on the 200' Sub, both being in ore. On the 290' Sub, drifts were driven 14' North, 10' South, 10' East and 10' West. All of this drifting was in high grade ore. The raise extends 90' above this sub. The second or most westerly raise was put up in ore, holing to the 150' and 200' Sub-Levels.

Three places were developed and are being mined on the Sixth Level. Two of these developments were for the Gogebic System of mining and the other for sub-level stoping. One of those being worked on the Gogebic System is in the extreme east end of the Main Deposit, and the other is in the north central riser of the Main Deposit. The place that was being developed for sub-level stoping is a small riser of ore which was discovered by a drift driven south from the north central riser. This ore is about 75' long and extends about 65' above the level.

Considerable development work was done between the Sixth and Seventh Levels, all based on the Gogebic System of mining. The two raises started from the Seventh Level last year were holed to the Sixth Level. The most easterly raise entered the ore 95' above the Seventh Level and continued in ore to within 18' of the Sixth Level. The other raise hit the ore 120' above the level and had ore all the way to the Sixth Level. Cut outs were made in these raises at three different elevations, the +25' Sub, +75' Sub; and the +90' Sub. There was 445' of drifting done on the +25' Sub; 332' on the +75' Sub and 795' on the +90' Sub. Three mills were put up from the +25' Sub to the +70' Sub; two from the +70' Sub to the +90' Sub, and eight from the 90' Sub to the Sixth Level

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7. UNDERGROUND (CONT.)

b. Development (Cont.)

The main haulage drift on the Seventh Level was advanced 140' to the Southwest in high sulphur ore, the averaged dried analysis of which was 57.52% Iron; .109% Phos., 7.69% Silica and 2.54% Sulphur. This drift was breasted in an East-West dike which at the present time is thought to be the southern limit of the ore body but this is just problematical as the only place this dike was crossed was on the Sixth Level near the East end of the ore body.

From a point 125' back from the breast of the Seventh Level, a raise was put up to the Northwest to an elevation of +22.4'. At this elevation, a drift was started to the Northeast and was advanced only 14' when it encountered jasper and was discontinued. A drift was then started to the Northwest and was advanced 105' in high grade ore. The work on this Sub was then stopped because of the place being very wet and there being no urgent need for further information at this time. It was also thought that this water might drain off in time. The first 55' of this raise was in ore averaging .252% Sulphur but at this point there was a very distinct break, the next analysis being .032% in Sulphur.

c. Stoping

Main Deposit

The ore located near the boundary line on the Sixth Level by Diamond Drill Hole No. 122 and which was developed last year, has been mined by the sub-level system from an elevation of +128' up to the hanging or an elevation of approximately +190'. This ore was mined from the 120', 150' and 180' Subs.

Slicing was completed on the 120' Sub adjacent to the boundary line and west of the North-South main haulage drift on the Sixth Level.

The north portion of the ore body, through which the boundary line runs, is being mined on the Gogebic System from an elevation about four feet (or the height of an underground car) above the Sixth Level. The portion of this ore mined from the Jackson Lease is 80' long and will average about 23' wide.

Slicing was completed on the 165' and 135' Sub-Levels and almost completed on the 120' Sub in the north central riser when the main haulage drift broke down and would require a complete retimbering. Instead of repairing the drift, the Gogebic system of mining was started on the Sixth Level, sending the ore to the Seventh Level. To date, an area about 40' x 50' has been mined on this system. On the 90' Sub-Level, just East of this area, a little slicing was done underneath the hanging.

The riser of ore discovered south of the north central riser is being mined by sub-level stoping from the 165' and 150' Sub-Levels and the 6th Level.

The riser of ore in the extreme east end of the ore body has been completely mined on the 135' Sub and is nearing completion on the Sixth Level. This ore is being mined on the Gogebic System.

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7. UNDERGROUND (CONT.)

c. Stoping (Cont.)

West Deposit

The mining of the West Deposit above the Sixth Level is nearing completion. This ore is being mined on the Gogebic System. There still remains on the Sixth Level, a strip of ore averaging 160' long and 30' wide, extending as high as the 135' Sub, to be mined from the Sixth Level. This strip of ore is adjacent to the boundary line.

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 iron and Phos:

No.	Level	Location	Dip	Course	Length	Ore Footage and Analysis	Iron	Phos.
129	6th	S. 150' E. 3585'	0°	S. 10° W.	104'	45-60'	61.52	.059
						70-104'	63.22	.075
130	6th	S. 158' E. 3844'	0°	S. 35° E.	40'	None.		
131	6th	S. 243' E. 3615'	0°	S. 17° E.	100'	None.		
132	6th	S. 298' E. 3270'	+15°	South	180'	95-126'	61.26	.088
133	6th	S. 186' E. 2977'	+5°	South	75'	None - being continued.		

John Trong
Engineer

JT:DAK/DWC
3-12-42.-3

LUCY MINE
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1. GENERAL:

The fences around the open pits and the old shafts were inspected during the Summer and necessary repairs made.

10. TAXES:

	1941		1940	
	Valuation	Taxes	Valuation	Taxes
Various Parcels	29,600	$ 982.98	29,600	$ 1,038.41
Collection Fees		9.83		10.38
Total	29,600	$ 992.81	29,600	$ 1,048.79
City of Negaunee Tax Rate Per $100.00 Valuation		3.321		3.508

For the third consecutive year there was a decrease in the City of Negaunee tax rate with a resultant decrease in the total taxes paid.

MAAS MINE
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1. GENERAL

The Maas Mine operated continuously during the year 1941 on a five day per week schedule with three regular 8-hour shifts during January, one extra 8-hour shift on Saturday from February to September and two extra 8-hour shifts on Saturday from September to the end of the year. The number of men employed underground was also increased until approximately two-thirds of the mining crews were on a three-shift basis, leaving the remainder on two shifts as their places are very wet and more time spent here by the tramming crews would delay the others enough to offset any gain in product from the wet places.

The total product for the year showed an increase of 120,933 tons over the preceding year, but the shipments were decreased by 72,619 tons, due to there being not as much ore in stock on January 1st, 1941, as there was at the same period in 1940. At the end of 1941 there remained only 78,198 tons in stock, according to the book figures. During the month of October an all-time record was made for the Maas Mine when 80,930 tons were hoisted, the best previous hoist being approximately 75,000 tons in June of this year. All of the Bessemer grade in stock was shipped during the year and showed a current year overrun of 4,404 tons. The Race Course pile was also cleaned up with an overrun of 2,232 tons and at the end of the shipping season all of the Maas grade in stock, totaling some 37,000 tons was previous or current year overrun, with approximately 24,000 tons previous year overrun already shipped during November. There was a small amount of special grade ore left in stock, this pile having been almost cleaned up several times during the season as it is stocked on the Southeast wooden trestle only and therefore the ore has to be removed without dismantling the bents.

Mining was carried on throughout the year in the same general areas that were worked during 1940, namely, the East and West footwall pillars above the 3rd Level, the two blocks just East of the Race Course lease on and above the 4th Level, and the main area above the 5th Level, and it was from the latter area that all of the Special grade ore was produced. The development of the Western end of the North footwall pillar between the 3rd and 4th Levels in preparation for open stoping without timber was continued and stoping was in progress from May to the end of the year with very satisfactory results. Exploration of the North footwall area between the 4th and 5th Levels, was started last fall and it was not until the last of this year that the ore attained sufficient size for economical mining. A new footwall drift to the East and a crosscut to the Southwest on the 4th Level, East of the Race Course lease were driven during the year, to replace those that had crushed beyond repair, and raises have been started in the East footwall pillar on the 3rd Level to take the place of the two transfer systems a short distance above the level. The diamond drilling on the 5th Level was stopped early in the year as it did not seem advisable to spend any more money in drilling further when all indications seemed to point out that there would be no decrease in the percentage of sulphur below the 5th Level unless considerably further to the West and at a much greater depth.

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Late in October an E & A was authorized for the development of the 6th Level, and work was immediately started both on the 6th Level at the Main shaft and on the 5th Level near the site of the auxiliary shaft. This preparatory work had to be done on Sundays until sufficient room had been made to allow the men to work without interfering too much with production of ore, due to delays to transportation equipment. It is expected that by the first of the year regular crews can be organized and work continued seven days per week on both of these operations, as it is very necessary to complete this development as soon as possible.

Work was completed on the changes to the main dry and the new surface dry with the exception of some interior painting and the new arrangement has proved very satisfactory, in that the clean clothes room is entirely free from dust and can also be kept at a much lower temperature, thus avoiding such an extreme difference to the outside temperature in the winter months. Exhaust fans have been installed in the dirty clothes room to remove the dust when the men are changing.

In an effort to further reduce the amount of water flowing underground one more well was put down near the Western edge of the cave area and in September a pump was installed producing 135 gallons per minute, which together with No. 3 Well, makes a total of 220 gallons being removed from the hanging side of the ore body. The other two wells along the North footwall pumped a total of 900 gallons continuously throughout the year, and these affeced a decrease in underground pumping of approximately 300 gallons per minute, mostly along the footwall areas and not as much from the working places as had been expected. A more complete detail of this work will be found later in the report under the caption "Drainage."

It is to be regretted that a fatal accident occurred at the mine during 1941, being the first fatal accident since October, 1933, when there was a double fatality on surface in connection with blasting the stockpile. Mr. George Newman was drilling the back of the bench in the stope on July 18th, 1941, when a large section of the brow, directly above him, came off, knocking him down and killing him instantly. It was found later that there was a slip in the ground between the piece he was drilling and the rest of the pillar which could not be observed from the outside, but allowed the section to fall when jarred by the drilling. The committee on fatal accidents did not attach any blame to the method of work, but suggested that in drilling back holes, the miner stand further back against the pillar and drill flatter holes, thus giving him further protection. Slips of this nature are very rare in the Maas Mine ore body, and it was unfortunate that it occurred in the one place where it was the most dangerous. Mr. Newman was 38 years of age and left a wife and three children.

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2. PRODUCTION, SHIPMENTS & INVENTORIES

a. Production by Grades

	1941	1940	Increase	Decrease
Maas Bessemer	25,241*	21,371	3,870	
Race Course Bessemer	9,338*	12,553**		3,215
Maas	561,478*	523,128**	38,350	
Race Course	116,660*	106,109**	10,551	
Maas Special	48,633	20,166	28,467	
Race Course Special	93,687	48,524	45,163	
R. C. Bess. Special	0	2,203		2,203
Total	855,037	734,054	120,983	
Rock	29,225	10,987	18,238	
Total Hoist	884,262	745,041	139,221	

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

**Includes current and previous year's stockpile overrun of 35,275 tons.

31,899 tons, or 4% of the actual product, was Bessemer grade.

b. Shipments

Grade of Ore	Pocket Tons	Stockpile Tons	Total Tons	Total Last Year
Maas Bessemer	2,267	44,394	46,661	26,231
Race Course Bessemer	226	9,320	9,546	19,857
Maas	296,656	270,468	567,124	713,956
Race Course	65,545	49,025	114,570	142,504
Maas Special	22,048	21,350	43,398	15,451
Race Course Special	34,974	61,534	96,508	32,427
Total	421,716	456,091	877,807	950,426
Total Last Year	303,165	647,261	950,426	
Increase	118,551			
Decrease		191,170	72,619	

Included in the above is 32,886 tons shipped all rail to local charcoal furnaces and 41,500 tons shipped all rail to Koppers Manufacturing Company at Granite City, Illinois.

c. Stockpile Inventories

Grade of Ore	12-31-41	12-31-40	Increase	Decrease
Maas Bessemer	4,824	26,244		21,420
Race Course Bessemer	18	226		208
Maas	33,134	38,780		5,646
Race Course	12,044	9,954	2,090	
Maas Special	10,404	5,169	5,235	
Race Course Special	17,774	20,595		2,821
Total	78,198	100,968		22,770

In addition to the above, there is 37,000 tons of Maas overrun in stock.

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d. Division of Product by Levels

	1941	%	1940	%
Third Level	269,245	32.6	219,250	31.3
Fourth Level	179,893	21.8	194,134	27.8
Fifth Level	378,231	45.6	286,593	40.9
Total	827,369	100.0	699,977	100.0

e. Production by Months

Month	Maas Bess.	Maas	Maas Spcl.	R. C. Bess	Race Course	R. C. Spcl.	Total	Rock
January	3,333	39,328	1,100	922	6,656	9,978	61,317	1,240
February	2,966	42,445	1,203	1,442	4,836	4,494	57,386	1,295
March	4,610	47,219	1,658	1,038	7,471	3,969	65,965	1,460
April	3,794	46,215	2,317	612	7,004	2,384	62,326	3,255
May	2,085	50,030	5,897		10,433	4,772	73,217	2,290
June	1,565	50,574	5,673	525	11,484	5,483	75,304	4,010
July	2,678	42,473	3,637	509	11,644	7,024	67,965	3,440
August	1,638	46,919	3,678		6,621	10,238	69,094	3,640
September	90	45,487	2,777		6,323	14,712	69,389	2,360
October	221	44,532	8,957		12,500	14,720	80,930	1,955
November	1,659	38,499	5,582	289	14,219	7,368	67,616	2,195
December	4,970	37,773	6,154	18	12,764	8,545	70,224	2,085
Total	29,609	531,494	48,633	5,355	111,955	93,687	820,733	29,225
1941 Stock-pile O'run	819			3,585	2,232		6,636	
Prev. Yrs. Overrun	913	23,884		2,871			27,668	
Gr. Total	31,341	555,378	48,633	11,811	114,187	93,687	855,037	29,225

The product was distributed as follows:

	1941	1940	Increase	Decrease
George Maas Lease	541,417	464,751	76,666	
Catholic Cemetery	60,200	59,184	1,016	
American Mining Co.	5,081	8,886		3,805
C.C.I.Co.(Right of Way)	10,268	17,274		7,006
Race Course	219,685	169,389	50,296	
City of Negaunee	18,386	14,570	3,816	
Total	855,037*	734,054**	120,983	

*Includes current and previous year's stockpile overrun of 34,304 tons.
**Includes current and previous year's stockpile overrun of 35,275 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 1-1-41	26,244	38,780	226	9,954	5,169	20,595	100,968	317,340
Product for Year	29,609	531,494	5,355	111,955	48,633	93,687	820,733	698,779
Trans. to & from	6,100	6,100	2,473	2,473				
1941 Overrun	819		3,585	2,232			6,636	
Prev. Yrs. O'run	913	23,884	2,871				27,668	35,275
Total	51,485	600,258	9,564	126,614	53,802	114,282	965,005	1,051,394
Shipments	46,661	567,124	9,546	114,570	43,369	96,508	877,807	950,426
Balance on Hand	4,824	33,134	18	12,044	10,404	17,774	78,198	100,968
Increase in Output							121,954	
Decrease in Ore on Hand							22,770	

Estimated stockpile overrun still in stock at end of 1941 shipping season:

	Current Year	Previous Year	Total
Maas Bessemer	0	0	0
Maas	15,324	21,676	37,000
Race Course Bessemer	0	0	0
Race Course	0	0	0
Maas Special	0	0	0
Race Course Special	0	0	0
Total	15,324	21,676	37,000

Maas, Race Course Bessemer, and Race Course piles were cleaned up during 1941 with a total of 34,304 tons of overrun shipped.

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 than 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.

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.

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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.

1937 2 8-hour shifts, 5 days per week, January 1st to April 17th, with a third 8-hour shift composed of a tramming and hoisting crew and approximately 16 mining contracts. April 17th to October 3rd, the same schedule as above with one extra 8-hour shift on Saturdays. October 3rd to December 6th, 5 days per week as from January 1st to April 17th. December 6th to December 31st, 2 8-hour shifts 6 days per week with the men alternating to average 4 days per week.

g. Delays
Electrical

Date	Shift	Duration	Loss In Product	Cause
Feb. 10th	Night	2 Hrs.	400 Tons	Electrical control on skip hoist out of order.
March 17th	Day	1 Hr.	100 Tons	Repairing panel board in engine house.
March 18th	Day	1½ Hrs.	200 Tons	Repairing panel board in engine house.
June 18th	Af'noon	½ Hr.	80 Tons	Repairing panel board in engine house.

Delays
Non-Electrical

Feb. 10th	Day	1 Hr.	0 Tons	Broken armature shaft on Larry car.
Feb. 25th	Day	1 Hr.	100 Tons	Large chunk of ore in 3rd Level pocket.
Feb. 26th	Day	1 Hr.	100 Tons	Replacing broken casing in skip shift.
March 14th	Day	1 Hr.	100 Tons	Repairing casing in skip shaft.
March 24th	Day	1 Hr.	100 Tons	Replacing shoes in skip.

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g. Delays (Cont.)
Non-Electrical

Date	Shift	Duration	Loss In Product	Cause
March 25th	Day	½ Hr.	60 Tons	Cutting off part of rope and respotting North skip, due to stretching of new rope.
May 16th	Af'noon	2 Hrs.	300 Tons	Large chunk of ore blocking 4th Level pocket, and repairing shaft opposite pocket.
May 24th	Af'noon	8 Hrs.	800 Tons	Replacing broken shaft runners.
July 7th	Day	½ Hr.	60 Tons	Replacing shoes on skip.
July 24th	Day	½ Hr.	60 Tons	Main Air Line broken.
Aug. 11th	Day	1 Hr.	150 Tons	Top tram car off track.
Sept. 16th	Night	2 Hrs.	300 Tons	Large chunk of ore in 4th Level Pocket.
Sept. 17th	Night	2 Hrs.	300 Tons	Breaking into dammed-up water on 4th Level and flooding tracks.
Sept. 29th	Day	2 Hrs.	300 Tons	Main Air Line broken.
Oct. 14th	Af'noon	1 Hr.	150 Tons	Loose runner in skip road.
Oct. 28th	Day	10½ Hrs.	1350 Tons	When loading the last skip, before changing the skip rope, the rope broke, allowing the skip to drop 30' to the skip pit. This rope had only been in service about 9 months and hoisted approximately 75% of the average hoist of the previous ropes, and started to show wear very rapidly over a 24-hour period. Therefore it was decided to put on a new rope at once, rather than wait until the mine was idle on Sunday.
Nov. 10th	Af'noon	1½ Hrs.	200 Tons	Changing skip shoes.
Nov. 19th	Day	½ Hr.	80 Tons	Repairing 5th Level measuring pocket.
Dec. 11th	Day	½ Hr.	80 Tons	Repairing runner in shaft.
Dec. 12th	Day	1½ Hrs.	200 Tons	Cutting skip rope and repairing dump.
Dec. 24th	Day	½ Hr.	70 Tons	Repairing head sheave.

3. ANALYSIS

a. Average Mine Analysis on Output

Grade	1941 Iron	1941 Phos.	1941 Sil.	1941 Sul.	1940 Iron	1940 Phos.	1940 Sil.	1940 Sul.
Maas Bessemer	61.70	.053	6.48	.018	62.19	.047	6.51	.021
Maas	60.12	.088	8.30	.019	60.92	.083	7.73	.022
Race Course Bess.	61.77	.049	7.54	.018	60.87	.046	6.14	.020
Race Course	60.09	.086	8.39	.020	61.49	.081	7.77	.025
Maas Special	60.90	.088	7.61	.116	61.44	.072	6.37	.224
Race Course Special	61.06	.077	7.07	.129	61.64	.069	6.70	.161

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b. Average Mine Analysis on Ore Shipped

Grade	Iron	Phos.	Sil.	Alum.	Mang.	Lime	Mag.	Sul.	Loss	Moist.
Maas & R. C. Bess.	62.05	.041	6.80	2.46	.19	.38	.15	.017	1.28	12.05
Maas & R. C. Non-Bess.	60.00	.088	8.68	2.66	.22	.56	.18	.020	1.78	12.60
Maas & R. C. Special	61.10	.076	7.10	2.62	.22	.57	.11	.153	1.58	12.85

c. Average Analysis on Straight Cargoes

	Mine			Lake Erie		
	Iron	Phos.	Silica	Iron	Phos.	Silica
Maas Bessemer (Maas & Race Course Bessemer)	62.09	.042	6.68	62.06	.042	10.95

d. Average Analysis of Ore in Stock - December 31, 1941

Average Natural Analysis

Grade	Tons	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moist
Maas Bess.	4,824	54.40	.047	5.60	.18	2.06	.35	.13	.013	1.00	12.24
Maas	33,084	53.35	.078	6.20	.18	2.06	.50	.16	.020	1.49	12.74
Maas Spcl.	10,404	52.40	.081	7.07	.18	2.00	.52	.16	1.100	1.60	12.30
R. C. Bess.	18	56.20	.065	3.54	.17	2.06	.35	.22	.013	1.00	11.73
Race Course	12,044	53.10	.072	6.60	.18	2.12	.41	.15	.026	1.30	12.57
R. C. Spcl.	17,774	53.30	.078	5.75	.18	2.30	.41	.23	.120	2.00	12.98

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	2,100	488,135	95,990	1,306	27,130	614,661
3rd to 4th Levels	243,793	1,920,000	12,240	10,417	11,167	2,197,617
4th to 5th Levels	252,831	891,273		29,548	3,730	1,177,382
Gross Total 11-30-41	498,724	3,299,408	108,230	41,271	42,027	3,989,660
Less 10% Mining Loss	49,872	329,941	10,823	4,127	4,203	398,966
Balance	448,852	2,969,467	97,407	37,144	37,824	3,590,694
Less 10% for Rock	44,885	296,947	9,741	3,714	3,782	359,069
Balance	403,967	2,672,520	87,666	33,430	34,042	3,231,625
Less Dec. 1941 Prod.	12,782	35,784	3,099	1,227	1,025	53,917
Total Standard Grade	391,185	2,636,736	84,567	32,203	33,017	3,177,708
Total Special Grade	628,495	443,501		28,674		1,100,670
Grand Total 12-31-41	1,019,680	3,080,237	84,567	60,877	33,017	4,278,378
N1/6 D.S.S.& A. Right of Way (Adams Strip)						12,706
Total Maas Group to be mined through Maas shaft.						4,291,084

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4. ESTIMATE OF ORE RESERVES

a. Developed Ore (Cont.)

170,000 tons of Maas and Race Course are estimated to be low phosphorus grade, of which one-half is contaminated by high sulphur.
1,217,966 tons in Maas area leased to Negaunee Mine.

INCREASE IN ORE RESERVES

	Maas	Race Course	Total
Above 3rd Level	90,000	1,000	91,000
3rd to 4th Levels	60,000	35,000	95,000
4th to 5th Levels	235,000	14,000	249,000
	385,000	50,000	435,000

Divided as to grades:	Maas		Race Course	
	Standard	Special	Standard	Special
Total	102,000	487,000	46,000	4,000

In comparison with 1940, this year's estimate of ore reserves shows a total increase of 435,000 tons, after taking out the production for 1941. The total amount of standard grade ore left in the mine shows a decrease of 56,000 tons while the special grade shows an increase of 491,000 tons. This is due to changing some 200,000 tons from standard to special grade due to analyses of ore in raises put up from the 5300 cross-cut during the year. This proved that a large amount of the ore lying East of the Race Course between the 4th and 5th Levels, which had been heretofore expected to be of standard grade contained over .100 in sulphur and therefore had to be changed to special grade.

The increase of approximately 91,000 tons above the 3rd Level was due mostly to the flattening of the hanging in the Western end of the East footwall pillar on the 385' Sub Level. The increase of approximately 95,000 tons between the 3rd and 4th Levels was due to two causes; first, the extension of the hanging to the Southwest in the Race Course lease on the 3rd Level and 175' Sub Level; second to the decrease in the size of the roll in the jasper footwall on the 4th Level, determined by the new cross-cut on the level cutting less jasper than had been anticipated. The total increase between the 4th and 5th Levels was due to the new development to the West on the 5th Level and the drilling of hole No. 36 to the North. This hole encountered 170' of ore before reaching the footwall, materially increasing the size of the ore body north of the dike.

c. Estimated Reserve Analysis

Natural Grade	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moist
Maas & Race Course Bessemer	54.00	.040	5.60	.180	2.00	.700	.200	.012	1.00	11.50
Maas & Race Course Non-Bessemer	53.00	.070	7.20	.190	2.20	.800	.240	.015	1.70	12.00
Maas & Race Course Special	53.30	.062	5.75	.190	2.10	.750	.220	.220	1.80	11.75

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d. Estimated Production

The following is the estimated tonnage and expected analysis, by grades, of the 1942 production from the Maas Mine on an operating schedule of 5 days per week, 3 straight 8-hour shifts; the third shift somewhat smaller than the other two; and on Saturdays 2 straight 8-hour shifts.

Grade	Estimated Production 17 Shifts per Week Basis
Maas & Race Course Bessemer	24,000 tons
Maas & Race Course Non-Bessemer	658,056 tons
Maas & Race Course Special	144,000 tons
Total	826,056 tons
Plus 4% overrun on ore Stocked	18,637 tons
Grand Total	844,693 tons

Grade	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moist	Iron Nat'l.
Maas & Race Course Bessemer	62.50	.043	6.50	.22	2.30	.60	.20	.015	1.00	11.25	55.47
Maas & Race Course Non-Bessemer	60.50	.082	8.30	.22	2.40	.85	.25	.020	1.80	11.75	53.69
Maas & Race Course Special	61.50	.070	6.50	.22	2.40	.85	.25	.250	1.80	11.75	54.63

5. LABOR & WAGES

a. Comments

1. Labor

There was an even greater change in the personnell of the Maas Mine employees during 1941, due mostly to the increase in working force and also to the loss of men transferred to the Mather Mine and drafted into the army. As was the case in 1940, all of the men hired for temporary work on the steam shovels and crusher during the shipping season, who were able to pass the underground physical examination, were placed underground in the fall. The few who could not pass were laid off until next spring. The record of the changes during the year is listed as follows:

	1941	1940
Died	7	4
Fatal accident at mine	1	0
Retired at age of 65 or over	1	6
Unable to continue work on account of ill health.	0	5
Transferred to other C. C. I. Co. properties.	14	4
In selective service of U. S. A.	17	2
Quit to go to school or other occupations.	8	5
Total	48	26
Hired or transferred to the Maas	79	80

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5. LABOR & WAGES

1. Labor (Cont.)

The average age of the employees in 1941 was 40 as compared to 39 in 1940, and 30 employees were 60 or over. Four of the men had served over 40 years in the company's employ and 84 over 25 years.

The vacation set-up for 1941 was slightly different than in 1940, in that the men who had worked 15 or more years for the company received a vacation pay check for two weeks at 44 hours per week and those who had worked at least 3 years received pay for 44 hours work. On account of the defense program, the men were not given a vacation but received their extra checks during August.

174 men received pay for 88 hours.
222 men received pay for 44 hours.

The safety bonus for the bosses was set up exactly the same as in 1940 and there was no safety bonus given to the men.

There were changes in both the wages and work schedule during 1941, the men receiving a 10 cents per hour increase in wages on April 1st, and the salaried men received a flat amount of $17.00 per month, being equivalent to the 80 cents per day increase the others were receiving. Also on April 16th a new time schedule was put into effect whereby the men were underground only 8 hours collar to collar, or check room to check room. Arrangements were made whereby only the men for a designated cage lined up at the check room situated at the North end of the tunnel leading from dry to shaft, and received their checks. At the same time a notation of which cage they were riding (namely, 1st, 2nd, etc.) was made on a special record opposite their brass check numbers and also the time of giving out the first check was entered on the sheet. The interval between cages was timed for several trips so that it could be determined when to start checking the next cage load. When the men came up they dropped their checks in a box at the check window and these were kept separate for each cage load and the time of the first check noted. After all the men were up these checks were gone over and marked on the record sheet opposite their numbers so that a complete record is obtained of when the men left, what cage they rode, up and down, and when they came up. An average of all cage loads show the total elapsed time to be 7 hours and 58 minutes. The men pick up their lamps beforehand as they like this better, and the time of doing so comes well within the two minutes extra. Their fuse cans hang on pegs along the tunnel wall and they pick them off as they go past. Under this arrangement the men get through approximately one-half hour sooner than they did under the old schedule. The surface schedule remained the same as before, it not being necessary to make any changes.

There was also one other change made in the working schedule when the first day of the working week was changed to Monday instead of Saturday as had formerly been the case. This was done at the request of the men, who felt that Saturday and Sunday should be the days on which overtime should be paid. Saturday had been used so that, if possible, men could stay home during the week if they had been called out for emergency work over the week-end, and thus not have to pay as

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5. LABOR & WAGES

1. Labor (Cont.)

much overtime. When work of this nature can be anticipated, the work schedule can still be staggered where work permits and avoid any more overtime than is necessary to maintain production. This change was effected on November 10th.

2. New Construction

There were expenditures on the following E & A's during 1941.

No. CC7 Remodeling change house.
" CC11 Sinking No. 3 Well by Layne Northwest Co.
" CC22 Development and exploring for ore below the 5th Level.
" CC52 Sinking 2 test holes by Layne Northwest Co.
" CC54 Purchase of 8 rocker dump cars for underground haulage.
" CC61 Sinking 1 test hole by Layne Northwest Co.
" CC66 Purchase of underground equipment.
" CC71 Purchase of Ford platform dump truck.
" CC77 Purchase of motor and pump for No. 4 Well.
" CC78 Development of 6th Level.

All E & A's will be taken up in Detail under No. 12, "New Construction."

b. Comparative Statement of Wages & Product

	1941	1940	Increase
Product	827,369	699,977	127,392
Number of Shifts & Hours	304	249	55
1 8-hour 26			
2 8-hour 21			
3 8-hour 257			
AVERAGE NO. MEN WORKING			
Surface	77	71	6
Underground	416	356	60
Total	493	427	66
AVERAGE WAGES PER DAY			
Surface	6.54	5.72	.82
Underground	7.30	6.35	.95
Total	7.19	6.26	.93
AVERAGE WAGES PER MONTH			
5.00 Days per week 1940			
6.00 Days per week 1941			
Surface	150.45	122.74	27.71
Underground	171.73	133.42	38.31
Total	168.41	131.64	36.77

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5. LABOR & WAGES

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

	1941	1940	Increase	Decrease
PRODUCT PER MAN PER DAY				
Surface	38.94	38.26	.68	
Underground	7.05	7.74		.69
Total	5.97	6.44		.47
LABOR COST PER TON				
Surface	.168	.149	.019	
Underground	1.036	.814	.222	
Total	1.204	.963	.241	
AVERAGE PRODUCT MINING				
Stoping	17.53	18.03		.50
Ore Development	9.10	11.25		2.15
Total	17.15	17.65		.70
AVERAGE WAGES CONTRACT LABOR	7.556	6.649	.907	
TOTAL NUMBER OF DAYS				
Surface	21,245¼	18,294¼	2,951	
Underground	117,383¾	90,398	26,985¾	
Total	138,628½	108,692¼	29,936¼	
AMOUNT FOR LABOR				
Surface	139,016.69	104,573.21	34,443.48	
Underground	857,285.10	569,968.15	287,316.95	
Total	996,301.79	674,541.36	321,760.43	
AVERAGE WAGES PER MONTH BASED ON MEN CARRIED ON MINE PAYROLL				
Surface	150.25	120.76	29.49	
Underground	171.38	132.95	38.43	
Total	168.24	131.01	35.29	

Proportion of Surface to Underground Men

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

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5. LABOR & WAGES

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

Proportion of Surface to Underground Men (Cont.)

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 - 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.

1937 - 1 to 5.2 — 2 8-hour shifts, 5 days per week, from January 1st to April 17th with a third 8-hour shift composed of a tramming and hoisting crew and approximately 16 mining contracts. April 17th to October 3rd, the same schedule as above with one extra 8-hour shift on Saturdays. October 3rd to December 6th, 5 days per week as from January 1st to April 17th. December 6th to December 31st, 2 8-hour shifts, 6 days per week with the men alternating to average 4 days per week.

6. SURFACE

a. Buildings and Repairs

The changes necessary to complete the remodeling of the dry were completed during 1941 with the exception of a small amount of interior painting in the West end of the building. Two large exhaust fans were installed in the walls of the dirty clothes room to draw off the dust along the floor, when the men were putting on their underground clothes. There is quite a stirring up of dust as they lower their dry clothes from the hangers and they naturally breath in a consid-

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6. SURFACE

a. Buildings and Repairs (Cont.)

erable amount, but with the fans operating, this dust is drawn downwards and out, making a very marked improvement. The interior of the dry has been painted a gloss white on the upper part of the walls and the ceiling and a gloss red on the lower walls, giving a very pleasing appearance besides being much easier to keep clean. The men stay out of the clean clothes room when in their underground clothes and the temperature is kept much lower in this room, therefore causing less change when going out of doors in the winter months. The new surface dry was built in the West end of the old boiler house and consists of three rooms, one each for dirty clothes, clean clothes, and washing, together with a small office for the surface boss and a tool room for general surface tools. This dry is also painted like the main dry and is heated by forced draft from overhead fan units. It is not necessary to have an exhaust fan as the surface working clothes do not accumulate sufficient iron ore to cause very much dust. This dry will accommodate some 75 men.

A protective coating of paint was put on the steel trestle during the year and as soon as the weather permits, the shaft house members will also be painted next year. This work took three men almost two months to complete, as they could only work when the weather was fair, and the same crew were used in painting the drys when it was raining.

There were improvements to several of the other surface buildings during the year as they became necessary. The garage was increased in size to take care of the new truck which had a longer body than the previous one. The roof of the engine house was patched where leaks had developed and it is probable that a new roof will have to be put on in the near future. New doors and windows were put in the East end of the boiler house and the brick walls repointed where necessary as this part of the building will be used for a general storehouse in place of the company barn on Lincoln Street, where the ground has started to cave, and the old coal dock which is in very bad shape due to rotting of the supports. Both buildings will be dismantled as soon as the material can be moved. The interior of the office building was redecorated late in the year as it had become impossible to clean the walls any longer and show much improvement. The walls were painted white and the woodwork a moss green which makes a very attractive appearance, and is restful for the eyes as this color absorbs the light without reflection.

During the year, it was decided to move the timber treating plant from the Athens Mine to the Maas Mine on account of the surface at the Athens Mine, where the plant was located, starting to cave. At first the plan was to lease a portion of the Maas surface to the Athens and therefore the Athens crew made an excavation and installed soaking vats and the necessary loading and unloading cranes. They also treated a considerable number of pieces of peeled timber during the latter part of the season. Later it was decided to have the Maas Mine buy this plant instead, and this will work out more satisfactorily as the labor will not have to be transported from one mine to the other and it can be done under the direction of the Maas Mine

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6. SURFACE

a. Buildings and Repairs (Cont.)

surface boss who is on hand, rather than send for the Athens boss. This plant is located to the East of the rock trestle between the pocket tracks and the coal dock.

b. Location Buildings and Repairs

There was a much smaller crew of carpenters and painters employed during 1941 than for several years previous, due to having sold so many of the Maas Mine houses. The second coat of paint was put on most of the remaining houses in the second addition and only a few are left to be painted in 1942. Only seven of the 61 houses in that location still belong to the company. This small crew also did repair work on some of the other company houses owned by the Maas, Athens, and Negaunee Mines. Quite extensive repairs and painting were done to the Finnish Lutheran Church and to House No. 174 which was to be occupied by the clerk of the Mather Mine. On December 31st, 1941 the Maas Mine owned 62 dwellings, a decrease of 25 as compared with 1940.

Single Family Houses	54
Two " "	4
Three " "	0
Four " "	1
Legion Club	1
Store	1
Church	1
Total	62

There were no homes purchased during 1941, but the following houses were sold in the First and Second Cleveland-Cliffs Iron Co. Additions.

House No.	Address	Lot	Block	Addition	Purchaser	Date
38	937 Pine Street	8	4	2nd	Victor Lyytinen	3-1-41
16	606 Lake Street	2	6	1st	John Mannila	5-1-41
26	930 Pine Street	22	2	2nd	Angelo Rubatt	5-1-41
149	933 Baldwin Road	11	2	2nd	Frank Johnson	5-1-41
158	106 Oak Street	8	3	2nd	George Kokko	5-1-41
139*	315 Cherry Street	4	2	Corbitts	Isadore Liquea	5-1-41
45	928 Oak Street	22 & N½ 21	4	2nd	Leonard Perry George Freeman	6-1-41
90	638 Lake Street	10	6	1st	John Herman	6-1-41
101	969 Pine Street	1 & N½ 2	4	2nd	John McNabb	6-1-41
102	920 Oak Street	20 & S½ 21	4	2nd	Jack Aho	6-1-41
144	925 Oak Street	S½ 3 & 4	6	2nd	Charles Saari	6-1-41
147	916 Maple Street	13	6	2nd	Carl Saari	6-1-41
153	924 Maple Street	15	6	2nd	Joseph Holman	6-1-41
161	941 Oak Street	2 & N½ 3	6	2nd	Herbert Nelson	6-1-41

*This house was dismantled.

House No.	Address	Lot	Block	Addition	Purchaser	Date
95	562 Elm Street	16	4	1st	Clarence Verran	7-1-41
151	1005 Baldwin Road	7	1	2nd	Eliza Harrington	7-1-41
155	932 Oak Street	S½ 24 & 23	4	2nd	Arthur and Martin Kantala	8-1-41
62	940 Oak Street	25 & N½ 24	4	2nd	Hilda Harvey	9-1-41
165	928 Maple Street	6	6	2nd	Ward Lundwall	9-1-41
88	626 Lake Street	7	6	1st	Charles Snyder	9-1-41
10	517 Prince Street	5	1	1st	Clarence Pope	9-1-41
169	965 Baldwin Road	3	2	2nd	Joseph Holman	9-1-41
135	961 Baldwin Road	4	2	2nd	John Lenten	10-1-41
59	509 Prince Street	3	1	1st	Ellsworth Chapman	10-1-41
160	918 Pine Street	19	2	2nd	Richard Uren	10-1-41
171	963 Pine Street	S½ 2 & N½ 3	4	2nd	William Richards	11-1-41
166	914 Pine Street	18	2	2nd	Was returned to the company after the purchaser, Howard Duquette, was killed in an automobile accident.	

c. Stockpiles

The different grades of ore stocked from the steel trestle lying East of the shaft were entirely cleaned up during the year, and therefore there is much more room available for 1941-42 stocking than last year when small amounts of Bessemer grade tied up approximately one-half the capacity of the trestle. The amount of Bessemer grade being produced has decreased to the point where one bent will be ample for an entire year, thus leaving the remaining eight bents for Maas and Race Course grade. It will be possible also to stock the wet ore, which amounts to approximately 30%, and has to be stocked during the shipping season, from the steel trestle while the wooden trestles are being dismantled. When this wet ore is allowed to stand it can be loaded out late in the fall without any difficulty and therefore almost a total clean-up can be made if the ore is needed. The Bessemer grade is being stocked at the extreme East end, the Race Course in the next three bents and the remainder for Maas.

It was possible to fill the requirements for Special grade ore without dismantling the single track wooden trestle lying to the Southeast of the shaft, and this was very fortunate, as there is no other trestle available for this grade and the shipping was very intermittent. It is hoped that this same situation will continue in 1942 and that there will be sufficient in stock when the first shipments start. At some future date it will be necessary to locate another place for this grade and put up a new trestle, as the legs will become rotten after standing in the ore for so many years. The special grade is stocked under two royalties, namely Race Course and Maas, the latter pile lying to the East.

There are two single-track wooden trestles lying West of the shaft, one equipped with a rope haulage system and one with the third rail electric system. Both of these trestles will be used for Maas grade

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6. SURFACE

c. Stockpiles (Cont.)

only and should be sufficient for all of the winter season's stocking. There were also ten additional bents added to the rock trestle, lying Northeast of the shaft, in anticipation of the rock to be hoisted from the 6th Level development.

Stockpile overruns were developed as follows:

	Maas Bess.	Maas	Maas Spcl.	R. C. Bess.	Race Course	R. C. Spcl.
Previous year overrun	913	23,884	0	2,871	0	0
Current year overrun	819	0	0	3,585	2,232	0
Overrun in stock December 1st, 1941	0	37,000	0	0	0	0
	1,732	60,884	0	6,456	2,232	0

d. Tracks, Roads, etc.

There were no changes made in either the roads or track throughout the property, but there was of course, the usual maintenance of both.

e. Timber Yard

The problem of keeping sufficient mining timber on hand becomes more difficult each year as the timber department has to go further to locate the same. With the exception of 9½' poles, however, there was always plenty on hand to meet the various needs and the weather was responsible for the lack of poles. There was an unusual amount of rainfall starting in the latter part of August and there has been practically no continual freezing to date with the result that the swamps are full of water and it is almsot impossible to build roads that equipment can pull over. For the last three months there have not been enough poles come in for both covering down and fore-poling and therefore planks, lagging, wire, etc. have been used for the former, leaving the balance for supporting the back.

Most of the timber is brought in direct from the woods by truck, but from the longer distances 135 railroad cars were received during the year.

f. Drainage

The pumping of water from the surface wells effected a further reduction in underground pumping during 1941, even though the rainfall for this year was greater than in 1940. There were two wells pumping continuously in 1941 and two others pumped intermittently. The average of the surface pumping was 975 gallons per minute as compared with 844 gallons in 1940, and the underground pumping averaged 928 gallons per minute, showing a decrease of 147 gallons from 1940. The underground readings were taken from the weirs placed on each level, rather

6. SURFACE

f. Drainage

than from the pump readings, as the former are considered more accurate. The decrease has not been sufficient to reduce the number of pumpmen, but the total cost for power required for surface and underground pumping decreased by approximately $600 per month. Most of the decrease has been noticed along the footwall side of the ore body, but there has also been a slight lowering of the water coming into the working places through the hanging and it is expected that there will be still more effect when Nos. 3 and 4 Wells are pumped continuously. This expectation is borne out by the fact that the test holes in this vicinity are still showing a lowering of the water table.

The Layne Northwest Company felt that, inasmuch as No. 3 Well was more or less of a failure, they should put down another well at their own expense, and therefore, they installed No. 4 Well approximately 450 feet Northwest of No. 3 Well. This work was completed in July. From this date to the end of the year there was an average of 135 gallons per minute being produced. This well was put down to a distance of 180 feet and only 12" shutter screen was used as the development did not warrant a larger installation. The pump installed was a 10" 9-stage Layne Bowler, operated by a 10 H. P. U. S. Motor.

It is disappointing that another well location cannot be found that will produce 500 or more gallons per minute, but all the drilling to date has discovered very little gravel where this could be done. Further expense seems unwarranted, and yet there is always the possibility of striking a favorable formation and if this happened, the results would more than pay for the work, as is borne out by past experience.

7. UNDERGROUND

a. Shaft-Sinking

There was no shaft-sinking in 1941, but late in October there was an authorization covering the sinking of the main shaft an additional 80' for pockets and skip pit and also an auxiliary shaft in the footwall near the ore body, approximately 1400 feet South of the main shaft. The present shaft is cut out at 102' below the 5th Level and this elevation will be considered as the 6th Level.

b. Development

As soon as the above authorization was obtained, work was immediately started on the four week-end shifts, Saturday night shift to Sunday night shift, inclusive, enlarging the plat at the main shaft on the 6th Level and also starting to drift north from the West footwall drift on the 5th Level for a switch track, approximately 250' long, 40' West and parallel to the main shaft cross-cut. The auxiliary shaft will be sunk from this location so as not to interfere with the

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7. UNDERGROUND

b. Development (Cont.)

transportation of ore on the main line. As soon as operations in both places have proceeded far enough to allow the men to work without interfering with production, they will be placed on a seven-day-per-week schedule. There were 5 to 6 contracts on development during 1941, two of which were drifting and the others raising. A detail of this development appears below.

Third Level

Near the middle of the year the two transfer drifts above the Third Level in the East footwall pillar began to show signs of weight, and therefore it was decided to put in a new cross-cut on the level which would take the place of these transfers. At the end of the year this cross-cut had advanced 150' and there only remained 70' to complete this work. This cross-cut was all in ore, except the first 22' which was in the jasper footwall. Two raises have been started and these, together with two more, will be put up to the 375' Sub, 65' above the level. Two raises were also put up further to the East, from the so-called 200 cross-cut, to the 385' Sub during the year. Another advantage in having these raises direct to the sub levels is obtained when water is encountered. In the transfer system, one wet raise contaminates the ore from the others, while in direct raises it can be piped down the ladder road.

200' and 215' Sub Levels - Stope Development

The development drifts and raises started last year in the West end of the North footwall pillar between Third and Fourth Levels was continued throughout 1941 with the completion of the raises from the 200' Sub to the hanging and eleven more raises put up from the 215' Sub to the hanging. These raises were connected with dog drifts at vertical intervals of 20' as stoping progressed, and at the end of the year development was almost completed with about 80% of the ore removed from the stope.

Fourth Level

Development on this level for 1941 consisted of driving a new footwall drift to the East, 110' North of the former one which had crushed beyond economical repair. The material here was all transition slate and jasper, but was too slabby to hold up without timber. A cross-cut was turned off to the South, 60' East of and parallel to the 4000 cross-cut which had also crushed. This cross-cut encountered ore just before crossing the old footwall drift and with the exception of a small horse of jasper continued in ore to the North boundary line of the Maas area leased to the Negaunee Mine, a distance of 550' from the switch. Six raises, two in the footwall drift and four in the cross-cut have been started, two of which were up 100' or more at the end of the year.

Fifth Level

The development on this level during the year consisted of the continuation of the drifting to the West in connection with the diamond

7. UNDERGROUND

b. Development (Cont.)
Fifth Level (Cont.)

drilling to determine the grade of ore below the Fifth Level. There were also ten raises put up to the hanging or to take the place of Fourth Level raises being lost through the mining approaching too near the Fourth Level.

About midway along the 5800 cross-cut North of the dike a drift was turned off toward the hanging for another drill station further to the West, but after drifting only 100' the jasper was encountered and it was decided to stop any further rock development. Any additional information received would not warrant the expense as the pitch of the ore body is so flat, that it would take about 400' of rock drifting to reach a point where the footwall would be enough deeper for a diamond drill to test below the present sulphur horizon. There was some further diamond drilling in 1941, but in each case the entire run of ore contained too much sulphur to be of standard grade.

Three raises were put up in the extreme South end of the 5800 cross-cut to determine the height of the hanging, but in no case was it of sufficient height to allow any mining from the Fifth Level.

Two raises were put up in the 5300 cross-cut to a height of 185' or 40' above the 4th Level. These raises were started in the footwall and encountered the ore at approximately 80' above the Fifth Level. One raise was put up in the 5600 cross-cut to take the place of two that were crushed when this area took weight about the middle of the year.

The following table shows the detail of the development footage as to location:

	Raising		Drifting	
Location	Ore	Rock	Ore	Rock
Third Level	202	0	128	22
200' & 215' Subs				
Stope Development	736	0	915	0
Fourth Level	283	83	285	599
Fifth Level	671	448	154	80
Total	1,892	531	1,482	701

Included in the above is 154' of ore drifting, 25' of rock drifting, 10' of ore raising under E & A CC-22 and 55' of rock drifting under E & A CC-78, all on Fifth Level.

7. UNDERGROUND

c. Stoping
General

There was an average of 37 contracts engaged in mining during 1941 on

7. UNDERGROUND

c. Stoping (Cont.)
General

a five or six days per week schedule, of whom approximately two-thirds were three-shift contracts. The remaining contracts were working in the wet areas where it is not economical to work these men more than two shifts, as generally the ore has to be scraped directly into cars tying up the transportation facilities. When the cars are held at the wet chutes, there naturally are a less number available for the dry chutes and therefore by allowing the dry ore to accumulate in the raises until the midnight shift, it can be pulled when the trains are not delayed by the wet ore. Eight new four-ton rocker dump cars were purchased to help out this situation, and these make up three trains of eight cars each on the Fifth Level, two trains on the Third Level, and one on the Fourth. There are also available a few spare cars that can be left inside where desired, to clean up the large accumulation of ore, spilled on the track or washed down by water in the wet areas.

The contracts averaged about 15% of their time on repairs to their raises or to the timber on top of their raises which nearly always crushes after the pillars on two sides of the raises are completed. In addition to the timbering done by contracts, there was an average of 77 men working on general repairs and a regular crew of six men employed on shaft, pockets, and chutes. This all naturally resulted in an increased cost per ton for timbering, although the product was considerably higher in 1941. Two other items that were largely responsible for this increase were the crushing of the 4000 cross-cut on the Fourth Level and the 5600 cross-cut on the Fifth Level, both having to be completely retimbered, and even then the former had to be abandoned and another cross-cut driven further to the East to take its place. The rate of mining necessary to large production also required more timbering, as props have to be put in or bulkheads built to support the ground or matt adjacent to the raises. The gob or matt does not have time to settle properly and therefore the men have to be protected from a sudden settlement. Cull hardwood ties have been supplied for making bulkheads, and these are far superior to the round timber formerly used, as they can be built faster, are more level, and can be wedged into place more securely.

There has been some further decrease in the amount of water pumped underground due to the surface pumping and although most of this decrease has been felt along the footwall, where the water is easier to control and therefore does not interfere with production as much, there has also been some benefit obtained on the hanging side where the water comes directly through the workings. One noticeable effect is on the tracks where formerly the water washed down considerable ore which piled up, faster than it could be taken care of during the operating shifts and caused damage to the transportation equipment. Now most of the mud and water can be contained in the ditches, leaving the track in much better shape. The two new surface wells along the West side of the cave have only worked intermittently during the year, but both are in good shape and it is hoped they will have more effect on the underground water next year.

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7. UNDERGROUND

c. Stoping
General (Cont.)

There was an average of eleven contracts mining in the East footwall pillar above the Third Level and at the end of the year the lowest elevation being worked was the 375' Sub at an elevation of 60' above the level. The hanging on the Western end of this area has flattened considerably, thereby increasing the size of the pillar to be mined. Two transfer systems were being used throughout the year, but a new cross-cut has been almost completed which will eliminate both of them. They were very practical while the area was dry, but water is now entering this area, with detrimental effect to the scraping of the ore on the transfer sub. Attempts have been made to keep the water in a ditch, but this soon fills with fine ore and blocks up, causing the water to mix with the ore while it is being scraped. These transfer drifts are being replaced by a new main level cross-cut and raises direct to the mining subs.

At the start of the year there were two contracts in the West footwall pillar above the Third Level, but one was removed in September as it was decided to mine the small pillar adjacent to the stope before taking the Eastern area and there was room for only one contract. No work was done in the vicinity of the old winze as the footwall drift on the Fourth Level, from which these raises were put up, crushed beyond repair early in the year. A raise from the new footwall drift was nearly completed at the end of the year and mining here will soon be resumed.

In the North footwall pillar between the Third and Fourth Levels North of the dike there was one contract slicing on the 185' and 175' Subs and development and mining was continued in the stope located in the Northwest end of this pillar. The development of this stope started last year, continued by raising and drifting above both the 200' and 215' Subs and was practically completed by the end of the year. One double shift contract started to break ore in the stope in April and by the end of the year they had produced approximately 28,000 tons. Mining here is about completed as the pillar becomes too wide as it approaches further East. Below the 200' Sub the North footwall approaches the dike to the South so rapidly that there only remains a small V-section to be removed, and to avoid too much rock development this ore will have to be removed by the slicing method after the open stope above has partially filled with rock broken from the hanging. This type of mining will probably not be attempted again in the Maas Mine as the hanging is too flat and irregular to make for efficient stoping operations.

Mining has been continuous in the two blocks lying East of the Race Course lease and above the Fourth Level with three contracts slicing in each block. By the end of the year the ore in both areas was being handled through raises to the Fifth Level with mining in the Easterly block 30' above, and in the other, 12' below the Fourth Level. A new footwall drift and cross-cut were driven on the Fourth Level during the year and raises started preparatory to mining the Third block to the East, in this area, which has been abandoned for a year due to crushing of the old main level drifts.

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7. UNDERGROUND

c. Stoping
General (Cont.)

The remaining 19 contracts were all concentrated in the area above the Fifth Level, two opening up under the hanging North of the North main dike, four mining in two pillars, between the South dike and the Negaunee Mine boundary, while the others were in the main area. In the latter, mining had reached the 25' Sub or 40' above the Fifth Level by the end of the year. As these contracts complete mining their respective pillars, they will have to be removed to the Fourth Level areas, as it is very doubtful whether the Fifth Level drifts will stay open with mining being carried on any closer. The area being opened up on the North footwall is increasing very rapidly, and as it is still 90' above the level it may be possible to introduce more contracts. Development of the Sixth Level will be pushed as rapidly as possible so that raises can be put up in the main pillar and mining of the special grade be resumed. Mining above the 5600 cross-cut, which was abandoned for almost six months due to crushing very badly, was repaired by twelve men on three shifts, seven days a week, as all of the timber had to be replaced and the track taken up and relaid.

The following is a detailed report of the mining operations at the Maas Mine. This subject will be covered briefly, stressing particularly the locations of the various gangs as well as the time of change.

Subs Between the 2nd & 3rd Levels

East Footwall Pillar

415' Sub Level

Mining operations were completed on this sub level in January. It was necessary to leave a small area in the Western end of the ore body, due to a bad caving condition caused by loose jasper and water. This particular area has always been exceptionally wet and due to a considerable amount of mining on the 401' sub level years ago, old timber as well as low covering often interrupted normal mining operations.

401' Sub Level

Due to the fact that only a 6' interval separates the 401' Sub Level from the 395' Sub Level, it was decided to eliminate the 401' Sub Level as far as actual mapping was concerned and show all operations as being mined on the 395' Sub Level, which was, incidentally, more nearly the correct elevation.

395' Sub Level

Mining operations on this sub level were continued during the entire year with the completion of operations in December. The ore mined was located in the Northwest portion of this pillar and adjacent to the North footwall. In general, mining conditions were greatly improved over that on the 415' Sub Level due to the fact that mining

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7. UNDERGROUND

c. Stoping

395' Sub Level (Cont.)

is now below the old workings, resulting from mining done in 1918, and relatively few old drifts were encountered. The area in the vicinity of Raises #108 and #108A was mined under very wet conditions, and here also the same trouble with loose jasper and water was encountered, necessitating the leaving of a few small pillars. Throughout the year Contracts Nos. 2, 3, 5, 7, 9, 35, 29, and 49 carried on mining operations on this sub level. Contracts Nos. 3 and 49, as well as Nos. 2 and 9, were mining from transfer raises which somewhat hampered progress due to the delays in hoisting timber through the transfer.

385' Sub Level

In general, this sub level was more active during the year than any of the others heretofore mentioned. Actual mining operations commenced late in 1940 in the East portion of the Third Level ore body. Early in the year, the American Mining Co. and the Cleveland Cliffs Iron Company strips, as well as the Roman Catholic Cemetery Lease were completely mined out, the operations being carried on by Contracts Nos. 6, 12, 29, and 7. The additions of Raises Nos. 203 and 204 from the 200 cross-cut greatly facilitated the mining of the South side of the central part of the ore body by materially shortening the scraping distance from the raise. Mining operations from these raises were carried on by Contracts Nos. 35 and 51. The 107 transfer raises from which Contracts Nos. 49 and 3 mined, were opened at this elevation in June. After connecting the raises, a long drift was extended over to the No. 111 transfer raises. Regular mining operations were then commenced and for the most part the areas adjacent to the jasper hanging as outlined on the sub level above were enlarged at this elevation by an average of about 20'. In October Contracts Nos. 9 and 2 moved to the 385' Sub Level and commenced drifting preparatory to mining in Raises Nos. 1111 and 1115.

During the month of December the following mining was done:

In the Maas Lease:

Contract No. 49 was slicing North of Raise No. 1071.
Contract No. 3 was slicing Northwest of Raise No. 1073.
Contract No. 2 timbered Raise No. 1111 and commenced drifting to the East.
Contract No. 9 completed a drift and slice Southeast of Raise No. 1115 adjacent to Contract No. 35 workings.
Contract No. 35 was slicing North of Raise No. 203.

In the Roman Catholic Cemetery Lease:

Contract No. 7 completed the mining of all remaining ore in the vicinity of Raise No. 115 by slicing North to the footwall.

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7. UNDERGROUND

c. Stoping

375' Sub Level

Mining operations were started on this sub level in June by Contract No. 6, connecting this East series of raises from Raise No. 122 to Raise No. 116. As the various raises were opened up Contract Nos. 12 and 29 moved down to this elevation and commenced mining very much the same as on the sub level above. Late in the year practically all of the Roman Catholic Cemetery, Cleveland-Cliffs Iron Company, and American Mining Company Leases were mined, most of the remaining ore lying along the footwall. In November Contract No. 51 cut out in Raise No. 204 and commenced a connecting drift toward Raise No. 203. In October Contract No. 5, after completing mining operations in the vicinity of Raise No. 111A on the 395' Sub Level, cut out 20' below in Raise No. 111A on the 375' Sub Level where a drift was started to the West. It might be added at this point that the reason for this contract moving down more than one sub level is to endeavor to mine along the North footwall at a lower elevation than other operations to the South; thus it is hoped that water which apparently follows the footwall will be drained by this drift which will be approximately one sub level below other mining operations to the South.

In December five contracts were active in mining on this sub level.

In the Roman Catholic Cemetery Lease Contracts No. 6 mined a pillar lying South of Raise No. 121 in the Cleveland-Cliffs Iron Company and the American Mining Company strips.

Contract No. 12 mined a pillar between the current workings and the connecting drift.
Contract No. 29 continued slicing Southwest of Raise No. 116. The production was divided between the Roman Catholic Cemetery and the Maas Leases.

In the Maas Lease:

Contract No. 5 extended the drainage drift to the West 115' encountering Raises Nos. 109, 108A, and 108.
Contract No. 51 completed a connecting drift between Raises Nos. 204 and 203 and thereafter commenced drifting and slicing along the South dike to the East.

Third Level

As previously mentioned, Raises Nos. 203 and 204 were extended to the mine sub levels early in January and were immediately put into service. Late in September a second cross-cut was started in the vicinity of Raise No. 107 and known as the 100 cross-cut. This drift will eliminate the present four transfer raises which are now being used to mine the West portion of the Thrid Level ore body.

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7. UNDERGROUND

c. Stoping

Third Level (Cont.)

Although the 100 cross-cut had to pass through several old drifts, no serious trouble was encountered until it reached the pillar adjacent to one of the old square set rooms where the ground was found to be quite loose with a tendency to develop runs.

In the Maas Lease:

In December Contract No. 39 commenced drifting Raise No. 103 toward the 385' Sub Level. Contract No. 15 advanced a total of 54 feet.

West Footwall Pillar

325' Sub Level

Mining operations in this area were carried on during the year by Contracts Nos. 10 and 11 with the ore being produced from the Race Course, City of Negaunee, and the Maas Leases. Contract No. 10, after completing mining to the West of Raise No. 5W moved to Raise No. 3W where a small portion was mined on the footwall. Contract No. 10 during this time was mining the area adjacent to the jasper hanging wall. In July all available ore had been mined and mining operations were then concentrated on the Third Level by Contract No. 11. Mining operations were then carried on in the West end of the ore body from Transfer Raise No. 300B and later No. 300A. In August Contract No. 10 was moved to the 40' Sub Level above the Fifth Level inasmuch as the small area of this Third Level ore body would not support two contracts. In December Contract No. 11 moved from Raise No. 300A to No. 300 where a small amount of mining was carried onto the Southwest in the City of Negaunee and Race Course Leases.

Subs Between the 3rd and 4th Levels

300, 280, 260, 240, 215, and 200' Sub Levels

The above title covers the various sub levels and elevations on which mining operations were carried on contributory to the stoping of the ore in the West limb of the ore body lying between the North footwall and a small dike from the Fourth to the Third Levels. During the months of January, February, and March development work was in progress from Raise No. 300B which connected the various mills which were driven from the 200' Transfer. Actual stoping operations were started by Contract No. 14 in April by milling in the vicinity of No. 1 mill located at the Northwest end of the 200 Transfer. During the first three or four months stoping operations were confined to the 260, 280, and 300' Sub Levels. Wherever the jasper hanging wall was encountered, it was found to be extremely sound and with a very definite contact between the ore and rock. This particular condition has seldom been found heretofore in the Maas Mine ore body. As stoping continued to the South, the ore which was originally developed

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c. Stoping

Subs Between the 3rd and 4th Levels (Cont.)

by the 215' Sub Level Transfer was encountered. Contract No. 19 was then used as a developing contract prior to stoping operations by Contract No. 14. In October a full width of approximately 75' had been stoped in the Southwest limb of the ore body and operations were now confined largely to the 240 and 260' Sub Levels. It might be added that the ore found to the South was of much softer character and the heretofore hard hanging became a great deal softer. During the development stage, frequent jasper horses were encountered with the result that at times considerable dilution lowered the average grade of ore.

In December Contract No. 14 continued stoping along the South side of the jasper footwall at a point approximately directly over the center of the 215' Transfer. Contract No. 19 completed two small dog drifts which mark the end of the necessary developing of this portion of the stope. Stoping will be completed early in 1942 and the ore to the East will be removed by slicing, as the area is becoming too wide to stope further.

195' Sub Level

All available ore was mined by Contract No. 27 to the South and West of Raise No. 305 late in January.

185' Sub Level

In February Contract No. 27 moved to Raise No. 306 and commenced drifting to Raise No. 305 where regular mining continued. The main dike which served as the Southeast boundary was practically vertical while the jasper cap-rock which bounded the ore to the Northeast cut out as mining descended, leaving a small 2' dike to serve as the North mining limit. The mineable ore at this elevation was practically double that found on the 195' Sub Level. Indications are that the jasper hanging to the West is flattening, which will further increase the size of this ore body as the Fourth Level is approached.

160' Sub Level

This sub level was open to mining in the area mentioned above, in November by connecting Raises Nos. 306 and 305.

In December a drift was completed and a slice started by Contract No. 27, preparatory to mining Northeast ofRaise No. 305 in the Race Course Lease.

150' Sub Level

Mining operations were continued throughout the year at this elevation by Contracts Nos. 25, 44, and 46. The former completed the

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c. Stoping

150' Sub Level (Cont.)

mining of all ore in the vicinity of Raises Nos. 625 and 626, which is bounded by old workings to the West and South and receding mining limits to the North and East.

Contracts Nos. 44 and 46 completed the mining of the Southease end of this block in December, using Raises Nos. 5324, 5326, and 5330. Considerable very hard blue steel ore was encountered during the later stages of the mining on this sub level with the result that the general progress was greatly impeded. It might also be added that this area was originally very wet with the usual accompanying rock runs. However, during the year the sub level was completely mined and covered with poles and wire with the result that little or no trouble should be encountered in the future.

In December Contract No. 46 mined the last remaining pillar Northeast of Raise No. 5626 and moved to the 50' Sub Level. Contract No. 44 also completed the last mining on this sub level by a slice Northeast of Raise No. 5330. This entire block is located in the Maas Lease.

130' Sub Level

In the Race Course Lease:

After the completion of Raise No. 5019 to this sub level, the raise was timbered and mining was started by Contract No. 16. The results proved rather disappointing inasmuch as there were only small ore seams in the vicinity of the raise and it was evident that the raise had been driven up in an enriched chimney with more or less misleading results.

In the Maas Lease:

Mining operations in the first block Northeast of the Race Course Lease was completed in March by Contracts Nos. 41 and 21 using Raises Nos. 5327 and 5331. Due to the continual retimbering of the Fourth Level drifts, approximately 12' below the ore had been drawn out, allowing the matt to come down and thus it was impossible to mine directly over these drifts.

The second block Northeast of the Race Course Lease was open to mining late in November. This work was done from Raise No. 625 and was the last ore to be removed on the Fourth Level as all subsequent raises to be opened originate on the Fifth Level.

In December Contract No. 25 completed a connecting drift in between Raises Nos. 627 and 5322. Later in the month this contract commenced drifting to the South toward Raise No. 5324.

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7. UNDERGROUND

c. Stoping

Fourth Level

In the Race Course Lease:

The ore in the vicinity of Raise No. 5019 was found to be no larger than that on the sub level above and after Contract No. 16 had driven an exploratory drift to the Northwest, operations were given up and the raise was again cut on the sub level below. The mining of the first block East of the Race Course and overlapping the Race Course, City of Negaunee, and the Maas Leases was completed by Contracts Nos. 21 and 41 in August. During the year Contract No. 28 continued mining from Raises Nos. 5410 and 5420 with Contract No. 37 using Raises No. 5422 and 5424. The mining of this area was somewhat hampered by the continual crossing of old Fourth Level drifts. This condition was also true in the area mined by Contracts Nos. 21 and 41 in the South end of the block which was completely mined by October, 1941.

A great amount of the development of the mine during 1941 was on the Fourth Level with a new footwall drift in rock and an ore cross-cut, which will eventually open up the winze area and the thrid mining block Northeast of the Race Course. In April a rock drift was started by Contract No. 4 at a point approximately 130' North of the beginning of the 4000 cross-cut. This drift was driven parallel and 110' North of the 4000 cross-cut with the 4100 cross-cut being driven to the Southeast and approximately 50' East of the old 4020 cross-cut which was abandoned in August of 1940, due to excessive crushing. The entire development amounted to approximately 900' of main level drift of which 400' was in ore and the remaining 500' in slate and lean ore. Raises Nos. 412 and 416 were started to develop the winze pillar lying just below the Third Level. Raises Nos. 4107, 4109, 4111, and 4113 were also started at the South half of the cross-cut.

In December, Contract No. 8 extended Raise No. 412 a distance of 49' to a total inclined height of 188'.

Contract No. 20 drove Raise No. 4107 a distance of 79' to a total inclined height of 96' above the Fourth Level.

Contract No. 31 extended Raise No. 4109 32' to a total inclined height of 42' above the Fourth Level.

Contract No. 4 completed the 4100 cross-cut with an advance of 65' in ore. In the second half of December Contract No. 4 moved to the Fifth Level.

Subs Between the 4th and 5th Levels

100' Sub Level

In the Race Course Lease on the North Footwall:

A somewhat larger area of ore was encountered in the vicinity of

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7. UNDERGROUND

c. Stoping

100' Sub Level (Cont.)

Raise No. 5019 at the 100' Sub Level. The ore extended South to the main dike and was also considerably larger East and West. This sub level was opened in June and completed by the end of July. The first block East of the Race Course Lease, lying partially in the Race Course, City of Negaunee, and the Maas Leases, was opened for mining in June by Contract No. 28; mining continued in the vicinity of Raises Nos. 5422 and 5424 by Contracts Nos. 28, 37, and 21. Contract No. 28 completed the mining of North end and moved to the 90' Sub Level in November, while Contracts Nos. 37 and 21 continued mining to the South. The ore in the North end of this block was cut off by a large dropper in the jasper hanging.

In December Contract No. 37 continued slicing North and East of Raise No. 5426.

Contract No. 21 completed a connecting drift from Raise No. 5426 to No. 5432 and thereafter commenced mining to the Southeast.

90' Sub Level

In the Race Course Lease on the North Footwall:

The mineable area in the vicinity of Raise No. 5019 was greatly reduced in size by the exploratory drift on the 65' Sub Level. This drift limited the mining to the West while a small exploratory raise which had caved, limited the mining to the South. This sub level was mined by Contract No. 16 during the months of August and September.

In the Maas and City of Negaunee Leases lying East of the Race Course:

Contract No. 28 commenced drifting on this sub level during November and late in the month had completed a drift between Raises Nos. 5410 and 5420. It might be added that mining on the sub level above had outlined an ever increasing jasper horse which was making into this area from the North. The result is that only a very small area of ore has been mineable on the sub levels above from Raise No. 5410.

In December Contract No. 28 completed a drift and two slices South and West of Raise No. 5420.

75' Sub Level

In the Race Course Lease on the North Footwall:

In October, Contract No. 16 moved to Raise No. 5022 where a drift was started to the East to connect Raise No. 5019. A drift was then extended Northeast of the raise; a traveling and ventilation raise was also drivento the Fourth Level. Contract No. 47 carried

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c. Stoping

75' Sub Level (Cont.)

on a small amount of mining at this elevation Northwest of Raise No. 5022 in July. However, this work showed up only a small amount of ore and the area was abandoned until Contract No. 17, which was made up of Contract No. 4 miners, moved in late in November and started to mine to the Northeast under the hanging which is very flat.

In December Contract No. 17 extended a drift and slice North of Raise No. 5022, a distance of 80' to jasper. Contract No. 16 commenced drifting North of Raise No. 5019.

In January only a small area remained to be mined in the North end of the Central ore body. This area was located South and East of Raise No. 5411, and was mined by Contract No. 18. Considerable trouble was experienced in the mining of this ore, inasmuch as the area was very wet with the usual accompanying ore and jasper runs. The mining of this area was completed in May.

65' Sub Level

In the Race Course Lease:

During the year, this sub level was being mined with an average of three contracts mining in three independent areas. Early in the year an unmined area remained just South of the dike on the Northern part of the central ore body, and Contract No. 48 completed the mining here in March by removing ore to the Northeast and Southeast of Raise No. 5614.

In June Contract No. 18 moved to Raise No. 5411 from the sub level above and by the end of the year had practically completed all mining in this vicinity. There was no particular change in the jasper boundary to the North and this area continued to be very wet and difficult to mine. Raise Nos. 5510, 5512, and 5516 were opened to mining in May, where Contract No. 40 and No. 45 continued mining during most of the year. The mining of the ore to the Southwest of these raises was somewhat handicapped by a large amount of water, as well as the fact that the area above contained numerous small pillars of jasper.

In December, Contract No. 18 completed one long slice Southwest of Raise No. 5411. To the North of the slice, jasper was encountered and no further mining will be done.

In the Maas Lease:

The other area mined on this sub level during the year was that of the South ore body adjacent to the Negaunee boundary line. To remove a pillar formed by a riser in the hanging it was necessary to extend No. 510 Raise after considerable mining had been done on

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7. UNDERGROUND

c. Stoping

65' Sub Level (Cont.)

the sub level below but which did not interfere with the removal of this ore. Mining of this pillar was completed in May and Contract No. 1 moved back to the 50' Sub Level. Contract No. 26 completed the mining of a small remaining pillar Southwest of Raise No. 511 in April and soon aftermoved to the 50' Sub Level where mining continued.

50' Sub Level

In the Race Course Lease:

A large part of the mining activities during the year were concentrated on the 50' Sub Level. Throughout 1941 an average of 12 contracts were mining, with the majority of them being located in the Maas Lease. At the present rate of production, about one sub level is removed each year. However, the necessity of abandoning the area mined from the 5600 series of raises in February due to crushing, greatly retarded normal mining progress. Practically 500' of the 5600 cross-cut was retimbered and retracked. This work was completed late in August. It was found that the tremendous pressure had collapsed practically all the raises and before mining could be resumed, four raises were retimbered while one new one was driven.

During the first few months of the year, Contracts Nos. 23, 24, and 43 continued mining the remaining ore pillars to the Southwest and East of Raises Nos. 5520, 5524, and 5528. In April, these contracts commenced moving to the 40' Sub Level where mining continued. The ore inthis area was practically all of special grade.

In December Contract No. 41 completed a drift and started a slice Northeast of Raise No. 5614.

Contract No. 47 completed three short slices to the Northeast of Raise No. 5618.

Contract No. 46 moved to Raise No. 5626A which had just been completed. This contract will commence mining the pillar which is believed to be making a large part of the pressure on the 5600 cross-cut.

The above three contracts resumed mining in this area as soon as the 5600 cross-cut was repaired.

In the Maas Lease:

The majority of mining in this South part of the central ore body was carried on from Raises near the South ends of the 5500, 5600, and 5700 cross-cuts. Contract No. 47 completed the mining of all available ore in the vicinity of Raise No. 520. The South part of this area was rather lean and it was evident that nor further mining could be done from this raise with the lean ore footwall moving in

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7. UNDERGROUND

c. Stoping

50' Sub Level (Cont.)

from the South. Mining also was continued in Raises Nos. 5542 and 5642 under identically the same conditions. Early in the year, mining was also completed by Contract No. 22 from Raise No. 5640 in an extremely wet area Southwest of the raise. Contracts Nos. 38 and 33 mined in the area controlled by Raises Nos. 5737 and 5745, completing the removal of ore on this elevation in August. There was no appreciable change in the general outline of the ore either to the North or to the West. In the small South ore body served by Raises Nos. 510 and 511 mining operations continued throughout most of the year. The jasper footwall, which on the sub level above paralleled the boundary between the Cleveland-Cliffs Iron Company and the American Mining Company strip, had on this sub level dropped back approximately 25', or parallel to the dividing line between the Maas and the Cleveland-Cliffs Iron Company Leases. There was no appreciable change in the limit of the ore to the Northeast and all mining operations in this area were terminated in December by Contracts Nos. 1 and 26. The ore in both of these areas was of special grade.

In December Contract No. 26 was nearing the completion of mining all available ore to the South and West of Raise No. 511.
Contract No. 1 finished two slices which marked the termination of mining in the vicinity of Raise No. 510.

40' Sub Level

Mining operations on this sub level reached a peak late in 1941 with a total of 10 contracts divided evenly between the Race Course and Maas Leases. The 5500 series of raises were opened to mining by the timbering of Raise No. 5538 to which Contract No. 32 moved in March. Mining progressed from South to North with the addition of Contract No. 43 in April and thereafter other raises were opened as their corresponding areas were mined on the sub level above. In similar manner, Contract No. 22 opened the South end of the 5600 area and late in the year were mining a pillar just North of the South Race Course line. The first mining on the 40' Sub Level was started by Contract No. 30 from Raise No. 5645. Shortly thereafter, Contract No. 48 opened Raise No. 5745 and commenced mining that area lying just North of the South dike and extending to the West under the jasper capping. Contract No. 48 completed the mining of this area in October and continued mining operations from Raise No. 5640. Contracts Nos. 33 and 38 moved down to this elevation near the middle of the year and continued mining from Raises Nos. 5737 and 5742.

In the Race Course Lease:

In December, Contract No. 23 commenced mining from Raise No. 5520 and completed a drift to the mining limit Northeast of the raise.
Contract No. 45 likewise commenced mining by drifting Northeast of Raise No. 5524.

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7. UNDERGROUND

c. Stoping

40' Sub Level (Cont.)

Contract No. 24 completed a drift and two slices Northeast of Raise No. 5526.
Contract No. 10 completed the mining of a small pillar East of Raise No. 5532 and thereafter commenced mining operations on the hanging side, or West of the Raise.
Contract No. 22 completed three slices North and West of Raise No. 5536. The last slice removed a pillar which of necessity was left by Contract 43 while mining from Raise No. 5534.

In the Maas Lease:

Contract No. 48 finished two slices to the dike Southwest of Raise No. 5640. A great deal of water continued to hamper progress.
Contract No. 30 early in December completed all mining in the 5645 area by finishing two slices Northeast of Raise No. 512. Later in the month, this contract commenced a connecting drift between Raises Nos. 512 and 511.
Contract No. 33 completed the mining of all ore West of Raise No. 5742. This contract will shortly commence mining to the East.
Contract No. 38 continued mining West and North of Raise No. 5737.

Approximately 75% of the ore removed on this elevation was of special grade.

25' Sub Level

In the Maas Lease:

The 25' Sub Level is probably the last sub level available for mining from the Fifth Level. Any future mining below this point will have to originate from the Sixth Level. Contract No. 31 in September drove a small exploratory drift East of Raise No. 5839. This was the first work done anywhere in this Western area above the Fifth Level and the results proved conclusively that the 5800 drift was comparatively short distance below the jasper cap-rock which forms the hanging wall of the Maas ore body. This work was given up in October. Contract No. 32 opened the South end of the central ore body in October by starting mining operations East of Raise No. 5538. The following month, Contract No. 43 extended a connecting drift from Raise No. 5538 to No. 5534 where mining continued to the Southwest.

In December, Contract No. 32 completed two long slices Northeast of Raise No. 5538 and commenced mining a small pillar west of the raise.
Contract No. 43 extended two slices Southwest of Raise No. 5534

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7. UNDERGROUND

c. Stoping

25' Sub Level (Cont.)

and later in the month, started and completed a drift East of the raise.

Fifth Level

In the first half of 1941 the exploratory work authorized under E & A No. CC-22 was completed. This included the completion of the South end of the 5800 cross-cut to the jasper as well as a short branch drift just North of the dike intersection. This drift was extended to the West approximately 120', and the entire distance was in lean ore and jasper. Two diamond drill hole stations were cut during the year; one in the South end and East of the 5800 drift, while the other was made on the North side of the West footwall drift. A detail of the results of the diamond drilling will be found under the exploration heading.

In May three raises were driven from the South end of the 5800 drift. These raises, which number 5837, 5839, and 5841 went up an average of approximately 50' and showed only a few seams of ore, with the remainder pure jasper. Raise No. 5025 was also raised to an inclined height of 65' on the South side of the Fifth Level drift and showed nothing but lean ore and jasper. In the middle of the year Raises Nos. 5022 and 5021 were also extended, the former to the 75' Sub Level, with the latter to a point 35' above the Fifth Level. For the most part the material encountered by these raises was lean, although it is possible that they will facilitate the mining of the ore body to the North of the main dike.

During the year Raises Nos. 5322, 5320, and 5318 were driven from the Fifth Level to the 130' Sub Level above the Fourth Level. These raises will take the place of the 600 series of raises on the Fourth Level, as the mining approaches the Fourth Level elevation. In November, Raise No. 5626A was extended to the 50' Sub Level in the central part of the main ore body to facilitate the removal of the pillar lying directly over the 5600 cross-cut, and to replace two raises which had crushed. In November, work was started on the auxiliary winze drift to the West of the main shaft cross-cut. Just North of the footwall from this drift a winze will be sunk in rock to the Sixth Level elevation approximately 100' below. This work was authorized under E & A CC-78 and the work is covered in detail in another part of this report. A considerable amount of repair work and maintenance was carried on throughout the year in all the Fifth Level drifts, which incidentally total a linear footage of practically 5000', or nearly a mile. Approximately 80% of this footage must be maintained for regular mining operations. A major portion of the repair work was carried on in the 5600 cross-cut as mentioned under the 50' Sub Level heading. Each cross-cut carried quite a flow of water which somewhat hampered both repairs to the track and the drift, as well as washing down a considerable amount of ore onto the tracks and ditches

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7. UNDERGROUND

c. Stoping

Fifth Level (Cont.)

In December, Contract No. 4 extended the winze drift from a point slightly North of the old powder house on the 5000 drift a distance of 105' to the North in slate. This material, from all indications, should stand up fairly well, and no timbering is anticipated.

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7. UNDERGROUND

d. Timbering

Kind	Linnear Feet	Price	Amount 1941	Amount 1940
6" x 8" Cribbing Timber	136,831	.0360	4,924.97	2,142.18
8" x 10" Stull "	123,916	.0678	8,402.85	7,987.50
10" x 12" " "	160,761	.0950	15,288.62	13,693.15
12" x 14" " "	60,610	.1302	7,889.93	5,651,63
12" x 14" Treated "	117		5.94	513.81
Total Timber - 1941	482,235	.0757	36,512.31	
Total Timber - 1940	368,651	.0813		29,988.27
7' Lagging	2,110,017	.7758	16,370.83	12,427.12
91' Poles	1,610,646	1.2977	20,901.65	18,837.40
Total - 1941	3,720,663		37,272.48	
Total - 1940	2,976,699			31,264.52
Wire Fencing	89,375	.01485	1,326.94	1,603.93
Grand Total - 1941			75,111.73	
Grand Total				62,856.72

	Amount 1941	Amount 1940
Product, Tons	827,369	699,977
Feet of Cribbing & Stull Timber per ton of Ore	.5829	.5267
Feet of Stull Timber per ton of Ore	.4175	.4426
Feet of Lagging per ton of Ore	2.5500	2.2332
Feet of Poles per ton of Ore	1.9470	2.0194
Feet of Wire Fencing per ton of Ore	.1080	.1621
Feet of Lagging per Foot of Timber	6.1088	5.0459
Feet of Poles per Foot of Timber	4.6631	4.5627
Cost per Ton for Timber	.0441	.0428
Cost per Ton for Lagging	.0198	.0178
Cost per Ton for Wire Fencing	.0016	.0023
Cost per Ton for Poles	.0253	.0269
Cost per Ton for All Timber	.0908	.0898
Equivalent of Stull Timber to Board Measure	981,006	761,851
Feet of Board Measure per Ton of Ore	1.1860	1.0880

Total Cost for Timber, Lagging, Poles, Etc., and Cost per Ton

Year	Amount	Cost Per Ton
1941	75,111.73	.0908
1940	62,856.72	.0898
1939	53,010.66	.1023
1938	40,290.86	.0951
1937	69,695.41	.0892

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7. UNDERGROUND

d. Timbering (Cont.)

There was a very slight increase in the cost per ton for timber, although the price per foot was a little less in 1941 and the product was much greater. This was due to more timbering in the mine, chiefly on the main levels and also putting up or repairing more raises. The percentage of 10 to 12" timber used remained the same but in the larger sizes it increased 3% with a corresponding decrease in the 8" to 10". There was approximately the same amount of ore removed from under new hanging, requiring extra poles, lagging, and wire to insure a perfect matt.

e. Drifting and Raising

The following is a comparison of the drifting and raising in the years 1941 and 1940:

	Drifting		Raising		
Year	Ore	Rock	Ore	Rock	Total
1941	1,328	621	1,882	531	4,362
1940	362	137	649	245	1,393
Increase	966	484	1,233	286	2,969

In addition to the above there was the following drifting and raising under E & A's which does not appear directly in the costs:

	Drifting		Raising
Year	Ore	Rock	Ore
1941			
E & A CC-22	154	25	10
E & A CC-78		55	
1940			
E & A CC-22	518	138	

The development in the Maas Mine was more than tripled in 1941 over that for 1940. Most of the drifting occurred on the Fourth Level in the new footwall drift and 4000 cross-cut, with a small amount on the Third Level. The raising was pretty well divided on all three levels and in the stope development.

f. Explosives, Drilling and Blasting

Stoping and Ore Development

Kind	Quantity Pounds	Average Price	Amount 1941	Amount 1940
1¼" 60% Amonia Gel. Pwd.	8,650	.1150	994.75	147.50
1¼" 50% " " "	5,600	.1100	616.00	616.27
1¼" Gelamite 1	314,623	.1150	36,181.64	30,940.75
Total Powder - 1941	328,873	.1149	37,792.39	
Total Powder - 1940	275,805	.1150		31,704.52

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f. Explosives, Drilling and Blasting (Cont.)

Kind		Quantity Pounds	Average Price	Amount 1941	Amount 1940
Fuse	M Ft.	1,290,077	5.128	6,615.93	5,400.55
#6 Blasting Caps	M	192,539	12.20	2,348.96	1,852.29
Electric " "	ea.	3,856	.105	405.59	88.90
Powder Bags	ea.	145	3.20	463.98	332.52
Tamping Bags	M	41,800	2.59	108.40	65.00
Fuse Lighters	M	37,500	6.75	253.14	219.42
Master Fuse Lighters	M	2,000	19.85	39.70	[illegible]
Fuse Seal					30.00
Connecting Wire	M Ft.	2,500	13.20	33.00	3.90
Miscellaneous				25.20	94.55
Total Fuse, Caps, Etc.				10,293.90	8,087.13
Total All Explosives				48,086.29	39,791.65
Product, Tons				827,369	699,977
Pounds of Powder per Ton of Ore				.3975	.3940
Cost per Ton for Powder				.0457	.0453
Cost per Ton for Fuse, Caps, Etc.				.0124	.0115
Cost per Ton for All Explosives				.0581	.0568

ROCK DEVELOPMENT AND FILLING

Kind		Quantity Pounds	Average Price	Amount 1941	Amount 1940
1¼" 60% Amonia Gel. Pwd.		4,500	.1150	517.50	30.00
1¼" 50% Amonia Gel. Pwd.					56.26
1¼" Gelamite 1		13,377	.1150	1,538.36	379.50
Total Powder - 1941		17,877	.1150	2,055.86	
Total Powder - 1940		4,050	.1150		465.76
Fuse	M Ft.	37,971	5.106	193.89	68.75
#6 Blasting Caps	M	5,703	12.20	69.57	23.89
Miscellaneous				1.90	7.71
Total Fuse, Caps, Etc.				265.36	100.35
Total All Explosives				2,321.22	566.11
Total Explosives Used at Mine				50,407.51	40,357.76
Average Price per Pound for Powder					.1150

Statement showing cost per ton for Explosives, exclusive of rock development, for the period 1937 to 1941:

Year	Cost per Ton	Production
1941	.0581	827,369
1940	.0568	699,977
1939	.0555	517,899
1938	.0565	423,570
1937	.0565	780,189

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7. UNDERGROUND

h. Mining and Loading

The entire product for the year, with the exception of the raise development, was handled by scraper hoist units of which there were 50 in service. Four of the larger 25 H. P. units were used on transfer subs, while the smaller 10 H. P. hoists were kept for exploration purposes only, being too small for efficient sub level mining. There were no new scraperhoists purchased during the year, as the Maas Mine has now reached the stage where no additional contracts can be added and with the present hoists kept in excellent shape by regular overhauls at the general shops, there is no need yet for replacements. There were, however, ten new single-drum air utility hoists purchased for handling timber in the raises, to replace some of the old single-drum type which had been converted from the first double-drum air hoists used for scraper hoists.

Approximately one-third of the contract were mining under new hanging, which necessitated the use of close poles and wire, followed by the blasting of the jasper above to form filling to protect the men when working in the sub below. This of course takes considerable time, and therefore to avoid delaying production, the contract is generally moved to some other territory if possible and a special crew put in charge of this work. If the area is too large to wait until the mining is completed, then extra men are placed with the contract to speed up the work. Lack of poles during the rainy season seriously delayed some of this work and necessitated the use of plank, short round lagging, etc.

During the latter part of 1940 and in 1941 there was found considerably more of the hard blue ore, which is very difficult to drill. As many as eight contracts at a time have been mining in this type of ground and therefore experiments have been tried in drilling to speed this up. Several jack-legs were purchased and these were put on wet machines which were equipped with rods and jackbits. Nevertheless it often takes 12 to 16 hours to drill a cut of 22 holes as the ground is not only hard but also very badly fissured, causing pieces of ore to drop behind the bit and making it almost impossible to draw the bits out of the hole. Small drills were also used a bar mounting, but the same trouble was experienced. A heavy type of jackhammer, mounted on a jack-leg and drilling wet with jackbits produces the best results so far.

Handling of the ore from the chutes to the shaft pockets continued to be one of the major problems on account of so much water. With so many of the contracts in wet areas where the ore has to be scraped directly into motor cars it requires the utmost supervision to keep the places going. The dry ore is allowed to accumulate in the raises wherever possible and is only pulled when there are no wet places waiting to scrape. For this reason there are no third shifts in these latter, leaving the trains free to pull dry dirt. Where possible this wet ore is dumped into pockets at the shaft with some dry ore and then can be loaded into the skip in the usual manner. However, there are times when this ore is not of the same grade or there is not enough dry ore and then it must be dumped directly into the skip.

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7. UNDERGROUND

h. Mining and Loading (Cont.)

The levels and tracks have been kept in better shape than for a long time by adding more Company Account laborers and having them work on the ditches during the shift as well as loading spare cars wherever these can be spotted without interfering with the regular loading. Another locomotive was purchased and this has allowed the taking of one of the old ones to the general shops in turn and receiving a complete overhaul. There has also been a larger crew on track repairs this year and all these factors, together with the purchase of eight more cars have resulted in less repairs to motors and cars, and therefore the delays due to tieing up of equipment have been almost eliminated.

i. Ventilation

The ventilation, except for a few weeks in the extreme cold weather, has been much improved, due to more connections between the Maas and Negaunee mines and also more large rock raises in the Negaunee Mine through which the air passes readily before reaching the Maas. There has been sufficient openings between the Negaunee Twelfth Level and the Maas Third Level for some time, but until this year the openings from the Negaunee Thirteenth Level to the Maas Fifth Level were not adequate. During the year the new Fourteenth Level, Negaunee, holed to several raises from the Maas Fifth Level and this allows plenty of air to reach these lower workings. A new fan installation, together with a heating system was being installed at No. 2 Shaft, Negaunee Mine, late in the fall, and as soon as this is in operation the shutting off of the air, due to ice forming on No. 2 Shaft and practically closing the passage during the very cold weather, will be eliminated. Where necessary during the completing of sub level areas, auxiliary fans have been installed to push air from the level up into these places, but generally is has been possible to ventilate them sufficiently by having doors on the level forcing the air up to the working places through a line of raises, and back to the level further along.

j. Pumping

The decrease in the amount of water underground, due to the surface wells, has resulted in the reduction in the time of pumping on the Third Level until by the last of the year there was required only two to three hours of operation of the second pump. This affords plenty of time for repairs and with the sumps cleaned out it is now possible to shut down completely for a short time if necessary on account of lack of current, and still not have to flood the levels. There has not, however, been sufficient reduction to cut down any on the pumpmen's time, it being necessary to have two pumpmen on all three shifts, but any additional reduction will probably make this possible. Most of the decrease has been noticed on the North footwall side of the ore body and as yet has not helped materially in the contracts. With constant operation of the two wells operating on the West side of the caved area it is hoped that a decrease will be obtained next year in the water entering the working places through the matt under the hanging where it is much more difficult to control.

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7. UNDERGROUND

j. Pumping (Cont.)

The number of gallons per minute pumped during 1941, 1940, 1939, 1938, and 1937 are shown below, as calculated by the Mechanical Department from the power consumption of the pumps

Month	1941	1940	1939	1938	1937
January	1,347	1,370	1,565	1,240	1,460
February	1,187	1,339	1,525	1,442	1,607
March	1,126	1,382	1,339	1,367	1,336
April	1,105	1,386	1,430	1,379	1,204
May	1,105	1,411	1,327	1,545	1,317
June	1,096	1,434	1,290	1,372	1,300
July	1,106	1,380	1,224	1,438	1,404
August	1,104	1,321	1,356	1,391	1,319
September	1,157	1,245	1,397	1,434	1,234
October	1,148	1,276	1,385	1,644	1,168
November	1,150	1,280	1,434	1,408	1,240
December	998	1,318	1,370	1,496	1,219
Total Average	1,145	1,345	1,387	1,430	1,327

Following is the number of gallons per minute as calculated from the underground wier readings and from the surface pumping for 1940 and 1941:

Month	1st Level	2nd Level	3rd Level	4th Level	5th Level	Total	Surface
			1940				
January	73	53	500	338	248	1,212	550
February	73	53	500	324	247	1,197	550
March	73	53	518	324	247	1,215	800
April	73	53	482	310	252	1,170	900
May	73	53	482	298	264	1,170	900
June	73	53	423	290	241	1,080	900
July	73	53	383	283	235	1,027	900
August	98	53	368	271	252	1,042	925
September	98	53	345	258	223	977	925
October	62	25	338	264	224	913	925
November	73	22	346	271	218	930	925
December	98	22	352	271	218	961	925
Average	78	45	420	292	240	1,075	844
			1941				
January	98	22	342	271	230	963	975
February	98	22	345	271	232	968	925
March	98	22	331	252	232	935	975
April	98	22	338	258	235	951	1,000
May	98	22	335	260	225	940	975
June	98	22	328	265	220	933	960
July	55	22	324	271	224	896	925
August	55	22	335	271	218	901	940
September	55	13	331	300	223	922	960
October	55	13	331	296	223	918	925
November	55	13	353	296	218	935	1,060
December	55	13	310	296	192	866	1,060
Average	76	19	334	276	223	928	975

MAAS MINE
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8. COST OF OPERATING

a. Comparative Mining Cost

	1941	1940	Incr.	Decr.
Product	827,369	699,977	127,392	
Underground Cost	1.500	1.277	.223	
Surface Cost	.123	.127		.004
General Mine Expense	.294	.265	.029	
Cost of Production	1.917	1.669	.248	
Depletion - Original Cost	.139	.140		.001
Increment	.000	.000		
Depreciation-Plant & Equip.	.044	.035	.009	
Development	.049	.035	.014	
Movable Equip.	.001	.001		
Taxes	.122	.203		.081
Loading and Shipping	.051	.064		.013
Total Cost at Mine	2.323	2.147	.176	
No. of Days operated	304	249	55	
No. of Shifts & Hours	1, 2 & 3-8	2-8		
Average Daily Product	2,722	2,829		107

COST OF PRODUCTION

	1941	%	1940	%	Incr.
Labor	1.235	64.4	.998	59.8	.237
Supplies	.682	35.6	.671	40.2	.011
Total	1.917	100.0	1.669	100.0	.248

b. Detailed Cost Comparison

(1) Days and Shifts

Year	Days Worked	Shifts & Hours	Men Employed	Total Days Worked
1941	304	1,2& 3-8	493	138,628½
1940	249	2-8	427	108,692¼
Increase	55		66	29,936¼

During 1941 there were three regular eight-hour shifts, five days per week and one extra eight-hour shift on Saturday from January 25th to September 1st, and two extra on Saturdays from September 1st to December 31st. The night shift is somewhat smaller than the other two, due to having no miners in the wet places.

There were two regular eight-hour shifts operating five days per week throughout 1940 with a small eight-hour hoisting shift for three-quarters of the year.

Total Men Employed in December of Each Year

	1941	1940	1939
Surface	81	71	71
Underground	422	388	357
Total	503	459	428

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8. COST OF OPERATING

b. Detailed Cost Comparison (Cont.)

(2) Wages

There was an increase of ten cents per hour, or eighty cents per day, effective April 1st, 1941, and on September 16th the bosses and foremen received an additional raise varying from eight to twelve cents on account of putting in 17 shifts per week.

(3) Comparison of Production

Year	Production	Average Daily Product
1941	827,369	2,722
1940	699,977	2,829
Increase	127,392	
Decrease		107

The increase in working schedule and working force accounts for the increase in product in 1941.

(4) Comparison of Number of Men & Wages

Year	No. Men	No. Days	Amount	Rate Per Day
1941	493	138,628½	996,301.79	7.19
1940	427	108,692¼	674,541.36	6.26
Increase	66	27,936¼	321,760.43	.93

(5) Tons Per Man Per Day

	1941	1940	Increase	Decrease
Surface	38.94	38.26	.68	
Underground	7.05	7.74		.69
Total	5.97	6.44		.47

The decrease in tons per man per day underground in 1941 was due partly to the decrease in tons per man stoping, but mostly on account of having more company account men on tracks and timbering.

(6) Cost of Production

1941	$ 1,586,005.77	Cost per ton 1.917
1940	1,168,523.28	" " " 1.669
Increase	$ 417,482.49	.248

	Total Cost				Cost per Ton		
	Labor	%	Supplies	%	Labor	Supplies	Total
1941	1,022,156.74	64.4	563,849.03	35.6	1.235	.682	1.917
1940	698,743.89	59.8	469,779.39	40.2	.998	.671	1.669
Incr.	323,412.85	4.6	94,069.64		.236	.011	.248
Decr.				4.6			

(7) Detail of Accounts	1941	1940	Incr.	Decr.
Avge. Days per week	6	5	1	
Shifts & Hours	1,2& 3-8	1 & 2-8		
Production, Tons	827,369	699,977	127,392	
Avge. Daily Product, Tons	2,722	2,829		107
Number of Days Worked	304	249	55	

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8. COST OF OPERATING

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

	1941		1940		Increase		Decrease	
Underground Costs	Amount	Per Ton	Amount	Per Ton	Amount	Per Ton	Amount	Per Ton
1. Exploring in Mine	1,145.48	.001	6,462.00	.009			5,136.52	.008
2. Development in Rock	12,541.63	.015	2,210.49	.003	10,331.14	.012		
4. Development in Ore	21,096.29	.025	6,061.38	.009	15,034.91	.016		
5. Stoping	432,596.62	.523	314,172.65	.449	118,423.97	.074		
6. Timbering	371,747.39	.449	249,715.35	.357	122,032.04	.092		
7. Tramming	128,472.99	.155	92,761.13	.132	35,711.86	.023		
8. Ventilation	9,946.76	.012	11,101.96	.016			1,155.20	.004
9. Pumping	62,685.45	.076	66,695.56	.095			4,010.11	.019
10. Comp. & Air Pipes	67,456.69	.082	50,120.82	.072	17,335.87	.010		
11. Back Filling	856.60	.001	1,028.61	.001			172.01	
12. Underground Supt.	29,980.31	.036	24,431.10	.035	5,549.21	.001		
13. Cave-In	511.77	.001	8.41	.000	503.36	.001		
14. Main. Compr. & Drills	4,157.09	.005	2,943.49	.004	1,213.60	.001		
15. Scrapers & M. Loaders	52,333.34	.063	37,642.30	.054	14,691.04	.009		
16. Elec. Tram Equipment	37,947.38	.046	19,340.04	.028	18,607.34	.018		
17. Pumping Machinery	7,774.70	.010	9,405.02	.013			1,630.32	.003
Total Undg. Costs	1,241,250.49	1.500	894,100.31	1.277	347,150.18	.223		
Surface Costs								
18. Hoisting	41,519.63	.050	35,827.44	.051	5,692.19			.001
19. Stocking Ore	14,100.47	.017	13,306.47	.019	794.00			.002
20. Screening, Crushing at Mine	913.63	.001	283.81	.000	629.82	.001		
21. Dry House	10,586.09	.013	9,708.20	.014	877.89			.001
22. General Surface	6,744.28	.008	5,507.85	.008	1,236.43			
23. Main. Hoisting Equip.	13,815.51	.017	8,369.54	.012	5,445.97	.005		
24. Shaft	2,146.15	.003	2,457.30	.004			311.15	
25. Top Tram Equipment	2,887.61	.003	2,232.53	.003	655.08			
26. Docks, Trestles & Pckts.	2,420.13	.003	4,822.53	.007			2,402.40	.004
27. Mine Buildings	6,688.95	.008	6,165.65	.009	523.30			.001
Total Surface Costs	101,822.45	.123	88,681.32	.127	13,141.13			.004
General Mine Expense								
28. Insurance	6,293.88	.008	3,636.19	.005	2,657.69	.003		
29. Mining Engineering	5,146.67	.006	4,742.88	.007	403.79			.001
30. Mech. & Elec. Engrg.	2,477.72	.003	2,141.76	.003	335.96			
31. Analysis & Grading	39,002.86	.047	29,226.47	.042	9,776.39	.005		
32. Personal Injury	49,939.30	.061	23,376.15	.033	26,563.15	.028		
33. Safety Department	2,511.94	.003	2,294.07	.003	217.87			
34. Tel. & S. Devices	1,907.95	.002	2,125.41	.003			217.46	.001
35. Local & Gen. Welfare	7,238.88	.009	6,612.94	.009	625.94			
36. Sp. Exp. Pens. & All.	12,924.44	.016	28,697.98	.041			15,773.54	.025
37. Ishpeming Office	25,748.86	.031	23,430.61	.033	2,318.25			.002
39. Mine Office	23,684.43	.029	20,691.31	.030	2,993.12			.001
Social Security Taxes	42,519.12	.051	29,127.29	.042	13,391.83	.009		
Employees' Vacation	23,536.78	.028	9,638.59	.014	13,898.19	.014		
Total Gen. Mine Exp.	242,932.83	.294	185,741.65	.265	57,191.18	.029		
Cost of Production	1,586,005.77	1.917	1,168,523.28	1.669	417,482.49	.248		
40. Taxes	101,324.64	.122	142,234.06	.203			40,909.42	.081
Total Cost	1,687,330.41	2.039	1,310,757.34	1.872	376,573.07	.167		

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8. COST OF OPERATING

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

GENERAL

Most of the accounts show an increase in amount and also in cost per ton due mostly to increase in cost of material and labor account of overtime and increase in wages.

UNDERGROUND COSTS

3. Development in Rock

	Drifting	Raising	Total Feet	Cost Per Foot
1941	621'	531'	1,152'	10.36
1940	137'	245'	382'	5.79
Increase	484'	286'	770'	4.57

The rock development during 1941 occurred mostly on the Fourth Level due to the new footwall drift and cross-cut. The increase in cost per foot was due to a larger percentage of drifting in 1941, whereas there was more raising in 1940.

4. Development in Ore

	Drifting	Raising	Total Feet	Cost Per Foot
1941	1,328'	1,882'	3,210'	6.31
1940	362'	649'	1,011'	6.00
Increase	966'	1,233'	2,199'	.31

There was more development in ore during 1941 on all three main levels and also in the stope between Third and Fourth Levels. The increase in cost per foot was due to the increase in wages.

5. Stoping

	Labor	Cost Per Ton	Supplies	Cost Per Ton	Total
1941	368,503.84	.446	64,092.78	.077	.523
1940	266,950.42	.382	47,222.23	.067	.449
Increase	101,553.42	.064	6,870.55	.010	.074

The increased amount in 1941 was due to an 18.2% larger production and increase in labor cost account of time and one-half for overtime, also more days worked by men. The increase in cost per ton was due to the increase in wages and also on account of more overtime.

6. Timbering

	Labor	%	Cost Per Ton	Supplies	%	Cost Per Ton	Total Cost Per Ton
1941	278,132.23	74.8	.336	93,615.16	25.2	.113	.449
1940	162,097.81	65.3	.228	87,617.54	34.7	.129	.357
Increase	116,034.42	9.5	.108	5,997.62			.092
Decrease					9.5	.016	

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8. COST OF OPERATING

b. Detailed Cost Comparison
(7) Detail ofAccounts (Cont.)

6. Timbering (Cont.)

More timber was used account of a larger production. The increase in labor due to more days worked and overtime paid for over 40 hours per week. There was also more main level timbering done in 1941.

7. Tramming

	Labor	Cost Per Ton
1941	116,058.21	.140
1940	82,361.10	.132
Increase	33,697.11	.008

The increased cost per ton was due to time and one-half paid for overtime and also to increase in wages.

8. Ventilation

	Cost	Cost Per Ton
1941	9,946.76	.012
1940	11,101.96	.016
Decrease	1,155.20	.004

Decrease due to extra expenditures done at Negaunee Mine, putting up large rock raises in 1941.

9. Pumping

	Surface	Gals. Per	Underground	Gals. Per	Total
	Gallons Pumped	Min.	Gallons Pumped	Min.	Cost for Power
1941	512,460,000	975	595,237,587	1,145	44,934.20
1940	443,606,400	844	710,849,782	1,345	52,335.16
Increase	68,853,600	131			
Decrease			115,612,195	200	7,400.96

The decrease was due to less water being pumped underground in 1941, although there was an additional amount pumped on surface. This shows that the saving in power is almost sufficient to pay for the installation of one well every two years, besides any saving that is being effected underground and yet can not be shown in actual figures.

10. Compressors & Air Pipes

	Cu. Ft. Air Compressed
1941	1,646,145,000
1940	1,288,665,000
Increase	357,480,000

The increase of cu. ft. of air compressed in 1941 was due to the increased working schedule.

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8. COST OF OPERATING

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

12. Underground Superintendence

	Cost	Cost Per Ton
1941	29,980.31	.036
1940	24,431.10	.035
Increase	5,549.21	.001

The increased cost and cost per ton was due to increase in salary of underground foremen and shift bosses and carrying two captains for three months account of sickness.

14. Main. Comp. & Drills

	Cost	Cost Per Ton
1941	4,157.09	.005
1940	2,943.49	.004
Increase	1,213.60	.001

During 1941 the following machines were charged to this account: 1 R48 Stoper, $367.00; 1 Cleveland HC 20 Auger Drill, $190.00; 6 Auger Drills, $1,205.00; and 12 Jacklegs, $785.00; also installed Intercoolers, Panel Filters, and Pressure Regulators on Compressors.

15. Scrapers and Mechanical Loaders

	Cost	Cost Per Ton
1941	52,333.34	.063
1940	37,642.30	.054
Increase	14,691.04	.009

Increase due to increased operating schedule in 1941, necessitating more repairs, more rope and other scraper equipment.

16. Electric Tram Equipment

	Cost	Cost Per Ton
1941	37,947.38	.046
1940	19,340.04	.028
Increase	18,607.34	.018

The increase was due to increased use of tram equipment, moving a greater product on a 24-hour basis; also increasing track crew and putting tracks in better condition, 1941.

17. Pumping Machinery

	Cost	Cost Per Ton
1941	7,774.70	.010
1940	9,405.02	.013
Decrease	1,630.28	.003

Decrease due to less charged to surface wells in 1941.

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8. COST OF OPERATING

SURFACE COSTS

18. Hoisting

	Total Ore & Rock	Power Cost	Cost Per Ton For Power	Cost Per Ton
1941	856,594	28,953.53	.0338	.050
1940	700,927	26,112.12	.0372	.051
Increase	155,667	2,841.41		
Decrease			.0034	.001

Increase due to increased operating schedule, making electric power expense greater; also labor in 1941.

19. Stocking Ore

	Tons Stocked	Amount	Cost Per Ton
1941	405,604	14,100.47	.017
1940	395,932	13,306.47	.019
Increase	9,672	794.00	
Decrease			.002

There was a slight decrease in the cost of stocking ore, due to the fact that the ore under one long trestle of some 30 bents was not cleaned up in time to reerect the bents in 1941 and therefore this cost that usually occurs in the late fall will not appear until 1942.

21. Dry House Expense

	1941	1940	Increase
Coal Used in Heat. Plant, Tons	872	662	210
Cost Per Ton for Coal	5.694	5.298	.396
Cost of Coal	4,965.13	3,507.45	1,457.68

Increased cost due to more coal charged Heating Plant in 1941.

22. General Surface

	Cost	Cost Per Ton
1941	6,744.28	.008
1940	5,507.85	.008
Increase	1,236.43	

Increased cost due to more general surface improvements in 1941.

23. Hoisting Equipment

	Cost	Cost Per Ton
1941	13,815.51	.017
1940	8,369.54	.012
Increase	5,445.97	.005

Increase due to four new ropes and new Lilly-Hoist control installed in 1941; also more repairs to skips, cages, and shaft roads.

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8. COST OF OPERATING

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

24. Shaft

	Cost	Cost Per Ton
1941	2,146.15	.003
1940	2,457.30	.004
Decrease	311.15	.001

Decrease due to less repairs to shaft and shaft pockets in 1941.

25. Top Tram Equipment

	Cost	Cost Per Ton
1941	2,887.61	.003
1940	2,232.53	.003
Increase	655.08	

Increase due to more repairs to top tram equipment in 1941.

26. Docks, Trestles & Pockets

	Cost-	Cost Per Ton
1941	2,420.13	.003
1940	4,822.53	.007
Decrease	2,402.40	.004

Decrease due to less repairs to trestles and pockets in 1941.

27. Mine Buildings

	Cost	Cost Per Ton
1941	6,688.95	.008
1940	6,165.65	.009
Increase	523.30	
Decrease		.001

High in both years; in 1941 expense was due to repairs to engine house roof, enlarging garage, and repairs to old boiler house to be used for a warehouse. In 1940 the expense was due to completing repairs to shaft house, new roof on dry, also part of removing old brick and partitions in old boiler house.

28. Insurance

	1941	1940	Increase
Property	2,835.90	922.27	1,913.63
Group	2,717.11	2,169.63	547.48
Catastrophe	740.87	544.29	196.58
Total	6,293.88	3,636.19	2,657.69

Increase due to expense of property, group, and catastrophe insurance greater in 1941.

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8. COST OF OPERATING

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

29. Mining Engineering

	Cost	Cost Per Ton
1941	5,146.67	.006
1940	4,742.88	.008
Increase	403.79	
Decrease		.002

Increase due to more expense to mine surveys and stocking trestle alignment in 1941.

30. Mechanical & Electrical Engineering

	Cost	Cost Per Ton
1941	2,477.72	.003
1940	2,141.76	.003
Increase	335.96	

Increase due to proportion of mechanical and electrical engineering expense greater in 1941.

GENERAL MINE EXPENSES
31. Analysis and Grading

	No. Determination	Lab. Expense Cost Per Determination	Analysis & Grading
1941	77,431	.311463	.503711
1940	62,334	.295856	.468869
Increase	15,097	.015607	.034842

Increased cost due to more determinations, and more overtime paid. There was a decided increase in the number of determinations, due to more shifts worked, but more to the increase in production of special ore, which requires an additional sulphur determination for each contract mining this grade.

32. Personal Injury

	1941	1941	Incr.	Decr.
Compensation Department	951.30	960.91		9.61
Hospital Loss	9,949.62	8,740.27	1,209.35	
Reserve & Catastrophe, Compensation set up & Medical Service	39,038.38	13,674.97	25,363.41	
	49,939.30	23,376.15	16,563.15	

The large increase was due to charging out the balance due on all compensation cases in December of this year.

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8. COST OF OPERATING

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

33. Safety Department

	Cost	Cost Per Ton
1941	2,511.94	.003
1940	2,294.07	.003
Increase	217.87	

Increase due to more expense to Safety Department in 1941.

34. Telephones & Safety Devices

	Cost	Cost Per Ton
1941	1,907.95	.002
1940	2,125.41	.003
Decrease	217.46	.001

Decrease dueto less safety equipment charged in 1941.

35. Local and General Welfare

	Cost	Cost Per Ton
1941	7,238.88	.009
1940	6,612.94	.009
Increase	625.94	

Increase due to more aid to employees in 1941.

36. Special Expense, Pensions & Allowances

	1941	1940	Increase	Decrease
Saranac Invest.	3,152.73	3,223.36		70.63
Legal	507.12	527.43		20.31
Pension	2,815.52	20,945.48		18,129.96
Miscellaneous	6,449.07	4,001.71	2,447.36	
	12,924.44	28,697.98		15,773.54

There was a large amount charged out in 1940 to set up a retirement fund for old employees.

37. Ishpeming Office

	Cost	Cost Per Ton
1941	25,748.86	.031
1940	23,430.61	.033
Increase	2,318.25	
Decrease		.002

Increase due to more expense in 1941.

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8. COST OF OPERATING

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

39. Mine Office

	Cost	Warehouse Overhead	Cost Per Ton
1941	23,684.43	6,058.43	.029
1940	20,691.31	5,452.94	.030
Increase	2,993.12	605.49	
Decrease			.001

Increase due to purchasing new Remington adding machine and new Monroe calculator, more expense to travel, and salary expense greater in 1941.

Employee's Vacation

	Cost	Cost Per Ton
1941	23,536.78	.028
1940	9,638.59	.014
Increase	13,898.19	.014

Increase due to change in vacation set-up. In 1941 men having 15 years or more service were entitled to two weeks' pay, men having 3 years or more service entitled to one week's pay. The men stayed at work. In 1940 all men with 5 years or more of service were given one week's vacation with pay.

40. Taxes

	Cost	Cost Per Ton
1941	101,324.64	.122
1940	142,234.06	.203
Decrease	40,909.42	.081

Decrease due to taxes on ore in the Maas area leased to the Negaunee Mine being assessed against the Maas and then charged to the Negaunee.

Analysis of Supplies Used

	1941		1940		Increase		Decrease	
	Amount	Per Ton	Amount	Per Ton	Amount	Per Ton	Amount	Per Ton
41 General Supplies	50,228.04	.061	38,657.40	.055	11,570.64	.006		
42 Iron & Steel	16,732.74	.020	13,227.73	.019	3,505.01	.001		
43 Oil & Grease	3,674.19	.004	3,023.50	.004	650.69			
44 Machinery Supplies	36,695.08	.044	18,528.66	.026	18,166.42	.018		
45 Explosives	50,183.33	.061	39,881.62	.057	10,301.71	.004		
46 Lumber & Timber	81,124.50	.098	65,544.11	.094	15,580.39	.004		
47 Fuel	4,681.13	.006	3,507.45	.005	1,172.68	.001		
48 Electric Power	145,134.08	.176	138,101.11	.197	7,032.97			.021
49 Sundries	15,985.51	.019	12,383.78	.018	3,601.73	.001		
50 Other Mines & Accounts	755.85	.001	529.37	.000	226.48	.001		
Total	403.682.75	.488	332,325.99	.475	71,356.76	.013		