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c. Stoping
General (Cont.)

pillars. In mining on three shifts, 17 shifts per week, the ore is removed so fast that the matt does not have a chance to settle gradually and therefore when it takes weight, it is liable to be very rapid with a consequent crushing and flattening of the timbers on the sub level. Often the raise cribbing also buckles and has to be removed and recribbed before one sub level interval is mined out and when there is no other place available for the miners to work, they do their own repairing. Otherwise, a special repair gang is put in the raise and the miners are placed elsewhere so as to keep up production.

The following is a detailed report of mining operations at the Maas Mine during 1942. This subject will be covered briefly, stressing particularly the locations of the various contracts, as well as the time when various developments took place or were started. Immediately following each sub level that is now active, a short sentence will describe the December work.

Subs Above the Third Level

East Footwall Pillar

385' Sub Level

In the latter part of 1941 the 385' Sub level was being mined to completion. A new 3rd Level 100 Cross-Cut had been completed and several raises were in operation replacing those raises which came from the two transfers in this West area of the 3rd Level ore body. These transfers were only a few subs below this elevation and the cost of repair together with the addition of a scraper operator on each transfer had more or less handicapped mining operations.

In January, Contract #49 moved from a transfer raise #1071 to a new raise, #103, from the cross-cut. Mining continued to the North and East and by July all available areas had been mined in the vicinity of this raise. Contract #3 made a similar change in March after the completion of Raise #104. At this time the contract moved from the transfer Raise #1073 to Raise #104 which originated from the new 100 Cross-Cut. Mining continued until July in a Southwesterly direction extending South to the jasper capping.

Mining operations were continued from the Transfer Raise #1111 by Contract #2 which mined to the Northwest and East on a territory in the central part of the ore body. This area had previously been drained by a drift driven during 1941 parallel to and along the North footwall. The drainage of this water greatly improved the mining conditions in this area. Transfer Raise #1115 was likewise used for the remainder of the sub by Contract #9 in mining to the South. The slices, for the most part, extended to the jasper capping and to the old workings on the South side a distance of approximately 130'. All mining was completed on the 385' Sub Level in July and transfer raises by this time were replaced by four raises originating from the 100 Cross-Cut. This entire area is located in the Maas Lease.

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c. Stoping (Cont.)

375' Sub Level

A drainage drift on the North footwall was being driven during the early months of 1942 by Contract #5. This operation preceded mining on this sub level and was used entirely as a drainage drift. In April, Contract #5 completed drifting and moved to Raise #111A on the sub below to continue this operation.

Contract #3 commenced mining operations in this area by drifting from Raise #104 to the North and slicing to the East and South. Several of the first slices butted against the drainage drift which was driven on this elevation a short time before.

In December Contract #3 continued slicing to the East by completing four slices to a jasper horse which has been present in this particular spot for several subs.

Mining operations by Contract #49 were commenced on this sub level in July by drifting to the Northwest toward the drainage drift and slicing to the West, where later in the year the slice butted against the original drift driven to the North by Contract #3.

In December Contract #49 completed a short traveling drift Southeast of Raise #103 to Raise #104. Later in the month this contract completed a slice to the Northwest adjacent to the original mining drift in the area.

Contract #2 also started mining on this sub level in July by drifting to the Southwest and slicing to the North. These workings, for the most part, ended in the old cave resulting from mining operations to the West which werecarried on some time ago.

In December after considerable repairs to the raise, Contract #2 completed a slice to the mining limit Northwest of Raise #105.

Contract #9 was the first contract to open the part of the 375' Sub controlled by the 100 Cross-Cut in June after cutting out in Raise #106. Mining was started to the Southeast and continued to the North. This area was entirely under the jasper capping and the outline of the ore mined added considerably to this Eastern portion of the 3rd Level ore body. Later in the year, mining was continued to the South and West ending in the old cave.

In December Contract #9 completed the mining of the last remaining pillar by taking three slices to the Northwest.

Contract #7 completed the mining of all available ore in the vicinity of Raise #115 and moved to Raise #113 where mining continued to the West and North. These operations were likewise completed in March and Contract #7 was moved to the 4th Level area where the new 4100 drift had opened several mining locations.

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c. Stoping (Cont.)

375' Sub Level (Cont.)

Mining operations were started by Contract #35 on this sub level at Raise #203. A drift was extended South to the caved area and mining progressed to the West and North being completed in June at which time this contract moved to the sub level below.

Contract #51 continued mining to the East from Raise #204 in January. This work was continued around to the North and later to the South where mining operations were completed in June.

Contract #29 were nearing the end of mining in the vicinity of Raise #115 early in the year. During January this contract was combined with #7 until a connecting drift was completed to Raise #113. During the next two months mining operations continued to the South and West and in April all pillars in the vicinity of Raise #115 had been mined. It might be added that with the exception of a portion near Raise #115, which was in the Roman Catholic Cemetery Lease, all the above mining was carried on in the Maas Lease.

In January Contract #6 completed mining operations to the Northeast of Raise #121 and moved to the 355' Level in February. This was similarly true in the case of Contract #12 which completed mining operations from Raise #120 in February. These two contracts are located in the Roman Catholic Cemetery Lease with a small bit of mining being done in the Cleveland-Cliffs Iron Company and American Mining Company Leases.

Contract #12 commenced mining on this sub level late in February and opened Raise #119 to mining shortly after. During the next seven months mining operations werecarried on to the South and West in the Cemetery Lease, however, due to a concentration of water in the vicinity of this raise, it was necessary to move this contract to Raise #116 where mining was continued and completed in October.

Contract #29 commenced mining on this sub level in May from Raise #116, however, as mentioned above it was necessary to move the contract to Raise #115 in July to avoid a water concentration as described above.

Mining operations in the South side of the ore body were carried on by Contracts #35 and #51 from Raises #203 and #204 respectively. For the most part, these contracts mined approximately the same area as that on the 375' Sub bounded on the South by old workings and on the North by the workings as described above.

After completing the North footwall drainage drift, Contract #5 moved to Raise #113 in July where mining was continued to the South West and North, being completed during November. It might be added that the jasper horse, which was in evidence on the sub level above, is apparently increasing in size and it was outlined by Contracts

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c. Stoping(Cont.)

355' Sub Level (Cont.)

#35 and #7. The above mining operations were located in the Maas Lease with a considerable amount in the Cemetery Lease from raises along the 3rd Level footwall drift.

In December, Contract #35 completed all mining to the South and North of Raise #203. Contract #51 finished mining a small pillar to the South and commenced the mining of the last remaining pillar to the North.

345' Sub Level

Generally speaking, each sub level has been opened in the extreme East end and all raises have been connected to the West. In opening this sub level the North footwall which is made up for the most part of the usual transition slate and jasper had flattened to the South to such an extent that the connecting drifts in this, the East end were entirely in rock, and for the most part, slate. Formerly it had been possible to cut off the water on the footwall North of the raise, but with the footwall contact to the South, the ore now has to be scraped through water from the contact to the raise. The new raises from the 4th Level will be in the hanging side of the ore body and the water can be drained off through the old 3rd Level raises, at least until 3rd Level is mined.

Contract #6 completed a connecting drift between Raises #122, #121 and #120, and thereafter commenced mining to the Southwest. This work was started in August and continued throughout the remainder of the year. In October Contract #12 completed a connecting drift from Raise #120 to Raise #119 in slate and thereafter commenced mining to the Southwest butting against the workings of Contract #6. In October Contract #29 completed the timbering of Raise #115 and after connecting Raise #114 mining was started to the Southeast to the workings of #6.

The mining operations in December are briefly described below:

Contract #6 completed one slice and started a second Southeast of Raise #121 in the Roman Catholic Cemetery and Cleveland-Cliffs Iron Company Leases.

Contract #12 continued slicing to the Southwest by completing two slices and starting a third in the Roman Catholic Cemetery Lease.

Contract #29 completed the driving of the first drift as well as two slices Southeast of Raise #115 in the Maas Lease.

Contract #5 made a connection between Raise #114, #113, and #111A in the Maas Lease, and is continuing to the West along the footwall to again drain off the water.

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c. Stoping (Cont.)

3rd Level

Early in 1942 Contract #15 extended the 100 Cross-Cut to the Southwest approximately 110'. This work was completed in May and two raises, Nos. #105 and #106 were extended to the 375' Sub Level and completed for mining in June. It might be added that this drift had to be driven in a pillar between two square set rooms with the result that a considerable amount of weight has caused almost constant maintenance and replacing of timber sets. This condition was not only felt on the drift itself but likewise in Raises #105 and #106 which were driven primarily to eliminate the transfer system in this location.

3rd Level - West

A small connecting drift was driven to the East by Contract #19 from the old South footwall drift West of the winze. This drift was extended a distance of approximately 100' where a connection was made to Raise #412 from the 4th Level. Previous to this an attempt had failed to timber over Raise #412 due to a large flow of water as well as caving ground, and it was also impossible to make a connection on the 3rd Level and all work was temporarily stopped in June. At some later date a drift will be driven from Raise #116 in an effort to open Raise #112 to the West. If this does not work out it is likely that a second raise will have to be extended into this territory at some future date, allowing the water to drain off through #112.

Subs Between the 3rd and 4th Levels

300' Sub Level

Stoping operations were completed by Contract #14 above the 215' Sub late in January and during the next month a transfer Raise #300A which originates from the long transfer on the 200' Sub Level was opened to mining. A connecting drift was driven to the West to Raise #300B and mining was continued to the West and South where the jasper hanging wall was located in approximately the same location as that outlined on the 3rd Level. In April mining was completed in the vicinity of the stope to the North and West of Raise #300B and in June, Contract #14 moved to the 280' Sub.

280' Sub Level

Contract #14 completed a connecting drift between Raises #300A and #300B in July. Mining from the latter raise was completed by the next month after removing a pillar between the raise and the old stope to the Southwest. Shortly thereafter, the contract moved back to Raise #300A where mining continued to the South and West striking the jasper hangingwall with each slice. The general location of the hangingwall as outlined on this sub level indicated that it was almost vertical with no apparent increase in size to the South. In October Contract #14 had completed the mining of all available ore on this sub level in this Race Course area and moved to the new cross-cut on

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c. Stoping (Cont.)

280' Sub Level (Cont.)

the 4th Level territory. The pillar left to the East in the Maas Lease can not be mined until a new rock raise is put up from 4th Level to control the ventilation as the raises carrying the air at present will cave when mining takes place.

260' and 240' Sub Levels

A small area was mined in the stope by Contract #14 during January. This work was done on the Northeast side of the stope and the ore was transferred from the 215' Sub Level Transfer to the 200' Transfer. This work was completed early in February at which time Contract #14 commenced mining on the 300' Sub Level as previously mentioned.

230' Sub Level

The second raise from the 4100 Cross-Cut was completed to this elevation early in 1942, and Contract #7 moved to Raise #4109 in March. It might be added that this is the third mining block East of the Race Course Lease. Contract #7 continued to mine to the mining limit Northeast of Raise #4109, for the most part under the jasper cap rock. Inasmuch as the raise was cut out under the jasper, no mining could be carried on on the foot or Southwest of the raise. Contract #7 completed the mining of this area in September.

215' Sub Level

Contract #20 was the first mining contract at this elevation in this same block which was previously opened in 1941 and then later abandoned due to crushing of the 4000 Cross-Cut, and this contract continued mining from Raise #4107 just Northwest of #7 Contract. The ore to the Northeast of Raise #4107 was very irregular in outline and several jasper horses were outlined. Mining was started to the Northeast and continued irregularly to the North where it was found that the ore extended further than it was possible to mine from this raise with the result that a mining limit was established and further development will be necessary to the North. In March Contract #20 continued to the East and South, completing the area in September. At this time Contract #7 moved to this sub level at Raise #4109 where mining was completed in December. The territory on this sub level mined by #7 was comparatively small as an attempt was being made to bring these contracts down on the same sub level as quickly as possible.

Late in December Contract #7 completed four slices to the East and moved to the 200' Sub Level.

200' Sub Level

This sub level was opened by Contract #20 in October at Raise #4107. A drift was directed to the Northeast and encountered the same horse

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c. Stoping (Cont.)

200' Sub Level (Cont.)

of jasper as outlined on the sub level above. Slicing then started toward the South.

In December Contract #20 completed two slices Northeast of Raise #4107 to the mining limit.

185' Sub Level

In September Contract #48 was moved from the 5th Level territory to this same mining block East of the Race Course at Raise #4111. The raise was cut out and the contract commenced drifting Southeast to the boundary of the Maas area.

In December slicing was continued to the Southeast to outline the area in this territory. It might be added that these workings are just below the old original mining drift on the sub level above which was developed from the 4000 Cross-Cut. This work was given up when it became impossible to maintain this cross-cut which has now been replaced by the 4100 Cross-Cut.

Contract #14 moved to this elevation also at Raise #4111 late in October. A drift and slice were driven to the old workings Southwest of the raise and for the most part lean ore and jasper was encountered.

In December a second slice was completed which indicated that a jasper horse would prevent mining to the North. Late in December Contract #14 moved to the 5th Level territory. The mining of the ore under the hanging in this area has materially reduced the pressure on the level below which had been so heavy as to cause the loss of the 4000 Cross-Cut and all the sets in the new 4100 Cross-Cut to be replaced three times.

160' Sub Level

Mining operations were continued in the Race Course Lease by Contract #27. This ore body lies South of a small dividing dike and North of the main North dike. The general size has been increasing to the West as mining continues. Late in 1941 Contract #27 had completed a connecting drift between Raises #305 and #306 and had completed the first drift to the Northeast. Mining then continued to the South with slices butting the main dike. Shortly thereafter, slicing continued on the North side and this contract moved to Raise #306 where mining operations were continued to the North and West. The sub was completed in September.

150' Sub Level

Early in October Contract #27 made a connection between Raises #305 and #306 and commenced drifting to the East with the workings butting the main dike.

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c. Stoping (Cont.)

150' Sub Level (Cont.)

In December, Contract #27 completed two slices and started a third Northeast of Raise #305 to the mining limit and the dike. The territory in which Contract #27 is located is in the Race Course Lease.

140' Sub Level

Late in 1941 this sub level was opened for mining by drifting from Raise #627 to Raise #5322. The latter as well as all raises used on this sub level originate from the 5th Level.

Contract #25 completed the connecting drift between Raises #5322 and #5320. Mining operations were then started by drifting to the North corner of this, the second mining block East of the Race Course. Mining operations then continued to the mining limit to the North and West, later contacting the old workings from the first block which originated from raises from the 5400 Cross-Cut.

In December, Contract #25 completed the mining of the last available pillar East of Raise #5320 and moved to the 130' Sub Level.

Contract #11 spent the entire year in mining the West and East areas of the block from Raise #5324.

In December Contract #11 had completed the mining of a pillar East of the raise by completing three slices to the mining limit.

In June due to a large number of useable raises in this block it was decided to add a new contract to this area with the result that #31 Contract commenced mining Northeast of Raise #5322. These operations continued to the South and thereafter mining continued to the West adjacent to the workings of #25 Contract to the North and #11 Contract to the South.

In December Contract #31 completed the last slice which removed the pillar Northwest of Raise #5322.

Early in 1942 Contract #44 completed a connection between Raises #5324, #5326, and #5330. Mining was started from the latter parallel to the Maas area boundary and butted into the 5400 workings to the Southwest. Mining then continued to the North until July at which time a drift was extended parallel to the boundary Northeast of the Raise.

Contract #44 then moved back to Raise #5326 and commenced mining to the Southeast and East to the drift mentioned above. It might be added that this particular area has an increasing amount of blue steel ore which has somewhat reduced the progress of mining operations in this immediate area, and productions is also handicapped by water which causes runs of rock and mud.

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c. Stoping (Cont.)

140' Sub Level (Cont.)

In December Contract #44 completed a drift and slice South of Raise #5326. This mining is being done in the pillar which is the last remaining on this sub level.

130' Sub Level

Late in December Contract #25 completed a connecting drift between the 5th Level Raise #5318 and the 4th Level Raise #625. The latter will be used for ventilating and traveling. It might also be added that one elevation in this block was practically all mined during the year with a corresponding amount of new work being done on this sub level to that on the sub level above at this time in 1941.

4th Level

Main level drifting operations were started on the 4th Level by Contract #15 in June. After this contract had completed the driving and repairing of the 100 Cross-Cut on the 3rd Level, the 400' footwall drift on the 4th Level which is being driven to the East was advanced approximately 400' from June through November. During this period a turnout was advanced a total of 70' to the Southeast which will be known as the 4200 Cross-Cut. This advance was entirely in transition slate and jasper and the entire distance had to be timbered. At several points during its advance, it was hoped that an untimbered small drift could be driven. However, due to the pitch of the formation the rock continually slabs off when exposed to air for any length of time.

In December Contract #15 advanced the 400 drift a total of 110' and at the end of the year approximately 350' remained to be driven. It might be added that this drift will develop the 3rd Level territory in the vicinity of the 100 and 200 Cross-Cuts, and it will be necessary to extend raises well over 200' with over half of this advance in rock.

Contract #8 during the entire year was used in putting up new raises from the 4100 Cross-Cut. Early in the year they advanced Raise #4109 to the 215' Sub. In May this contract moved to Raise #4111 and completed raising in July to the 185' Sub. The following month Raise #4105 was started and after a comparatively short advance raising operations were given up due to the striking of a water course which badly caved the back of the raise. During October Raise #4104 was started 30' to the North of the raise just mentioned.

In December the total inclined height was 78' with an advance of 68' during the month.

Contract #42 was likewise used in raising during the entire year and during the first five months completed Raise #412 to the 300' elevation. As mentioned under the 3rd Level heading this raise encoun-

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c. Stoping (Cont.)

4th Level (Cont.)

tered a large quantity of water, and it was necessary to abandon the operation until a second mining raise could be put up. In June Contract #42 started Raise #416 which was completed to the 260' Sub. In October steps were then taken to timber over the raise; however, here again a very large stream of water prevented this operation and the raise was temporarily abandoned. Contract #42 started Raise #422 in October and continued on throughout the year.

In December the total advance amounted to 41' to a total inclined height of 61' above the 4th Level. The ore contact was found to be at a point approximately 55' on the incline above the 4th Level.

Contract #39, also a raise contract, completed Raise #418 to the 260' Sub in October, encountering the ore at 50' above the level. This contract, during the first six months of the year were putting up raises from the 100 Cross-Cut on the 3rd Level. Raise #418 also hit a large water course and operations had to be temporarily abandoned. It might be added that the areas that Raises #412, #416 and #418 were driven into were extremely wet while mining above the 3rd Level and it is rather apparent that this difficulty will be continued unless an independent drainage raise and drift is driven along the North footwall. Late in 1942 Contract #39 commenced Raise #420 and in December had advanced a total of 18' to an inclined height of 28' above the 4th Level.

Several repair gangs were at work continually during the year in retimbering the 4100 Cross-Cut. The South end was particularly heavy in the vicinity of the air connection to the 14th Level of the Negaunee Mine. Later in the year after mining had progressed on the sub levels above, a considerable amount of the pressure seemed to be relieved and at the present writing retimbering is continued by one gang in the North portion of the cross-cut.

Subs Between 4th and 5th Levels

100' Sub Level

During the latter part of 1941 the first block East of the Race Course was being mined. Two contracts were located in the South end of the block just North of the Maas area boundary. Contracts #37 and #21 were mining from Raises #5426 and #5432, respectively. For the most part, mining continued to the South between the dike which served as the East boundary in the South end and the caved workings from the 5500 series of raises. Mining operations on this sub level were completed in May, at which time both contracts moved to the 90' Sub Level. This first block actually overlaps three leases which include the Maas, City of Negaunee, and Race Course Leases.

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c. Stoping (Cont.)

100' Sub Level (Cont.)

In November a connection was made between the three test raises extended from the exploratory drift on the 65' Sub on the North footwall just West of the Race Course Lease and a drift was driven to the West from the middle raise. This drift was extended to a point 155' from the raise entirely in ore with ore in the back for the entire distance. A small uncribbed raise was then put up from the South side of the drift to a point 135' above the drift, through alternate seams of ore and jasper for the last 70'. A considerable part of the upper portion proved somewhat lean and after several tests at various elevations, a small drift was driven to the North and South at a point 65' above the level. This drift was entirely in ore and indicated that the ore at this elevation was approximately 50' in width. This work was done in December and further development has been temporarily stopped to allow for the driving of the 5th Level drift into this territory from which raises will be extended to the hanging. During the last few months of development, three drill holes were driven to the North, to the South and to the Southwest. The results for the most part did not show any particular extension of the ore although approximately 40' of ore was found from 80 to 120' to the South which will be included in the development of this area.

90' Sub Level

This sub level was originally opened to mining by Contract #28 late in 1941. Early in the following year a connection to the 4th Level for ventilation and traveling was driven Northwest of Raise #5410. This drift and raise was maintained during a large part of mining operations in this block. Contract #28 mined from Raises #5410, #5420, and #5422 to the Northeast as well as the Southwest. The boundary to the Northeast was the regular mining limit and it was necessary to go through the dike which strikes to the Northwest and acts as the boundary on the South end of the block. In June Contracts #37 and #21 moved to this sub level and continued to mine from Raises #5426 and #5432.

In December Contract #37 completed two slices and started a third South of Raise #5426 to the boundary of old workings. Only a small pillar remained to be mined before this contract moves to the 75' Sub. Contract #21 finished three slices and were nearing the end of the fourth North of Raise #5432. A small pillar remains on this side before continuing to the West where operations should be completed early in 1943.

75' Sub Level

During the latter part of 1941, Contracts #16 and #17 had completed the connecting drift and started mining from Raises #5019 and #5022. In the case of the latter, most of the mining was done to the Northeast against the North footwall North of the main dike. This new area was under the jasper capping and it was evident that the ore

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c. Stoping (Cont.)

75' Sub Level (Cont.)

was making to the West as it descends toward the 5th Level. Several slices were taken to the Southeast, but it was found that this area was still lean with an apparent drop in the cap rock. Contract #17 completed mining on this sub level in May and moved to the 65' Sub.

Contract #16 also mined under the jasper to the North of Raise #5019. For the most part, this mining was in a wet territory and considerable care had to be taken. Mining operations were then directed to the South and West bounded by the main dike and the cave from the exploratory drift to the West on the 65' Sub. Here again a considerable amount of water greatly retarded mining operations. Contract #16 completed this sub level in May and also moved to the 65' Sub. The area mined, as mentioned above, is located entirely in the Race Course Lease.

In December Contract #14 moved to Raise #5424 preparatory to opening up this first block East of the Race Course for mining.

65' Sub Level

In June a new connecting drift was driven from Raise #5022 to Raise #5020. This work was done by Contract #17 while mining was started by Contract #16 Southeast of Raise #5020. Mining was continued in this direction until it approached Raise #5019 to which the contract then moved and continued operations to the East and South. Contract #17 drove an exploratory drift to the Northwest of Raise #5022 approximately 180'. At this point the jasper footwall was encountered and with the evidence of ore in the back of the North portion of the drift three test raises were put up. The first which was located South of the breast encountered jasper at 38' while the second approximately 50' Southeast of the breast was extended in ore to a point 65' above the sub level. At this point it was decided to further explore this upper extension of the ore and a third double compartment raise, through which timber could be handled, was extended to the 100' Sub in October.

Late in 1941 a small portion of the main ore body South of the dike remained unmined. This is the area where Contract #18 is located and work was continued Northwest of Raise #5411 and South of the main dike. Four slices were taken in this direction with one removing a pillar to the Southwest. This contract moved to the 50' Sub in April.

Early in the summer when it became apparent that the warmer weather was reducing the flow of air into the mine, it was decided to open a third ventilation drift to the Negaunee in an effort to better ventilate the 5500 and 5600 Cross-Cuts. As a result, a gang cut out Raise #522 at this elevation and drifted to the Northeast approximately 55'. The back of the drift holed to the Negaunee 14th Level and this opening is now being maintained for ventilating and an emergency traveling road.

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c. Stoping (Cont.)

65' Sub Level (Cont.)

In December Contract #28 moved to Raise #5020 and completed one slice to the jasper footwall Northwest of the raise and thereafter commenced slicing on the West side of the original exploratory drift South of the raise and North of the main dike. This slice was nearing the dike by the end of the month. Contract #16 finished three slices and started a fourth Southeast of Raise #5019. All of these slices stopped at the main dike and for the most part were extremely wet.

50' Sub Level

Mining operations at this elevation were concentrated on the North end of the main ore body in the Race Course Lease. Contracts #41, #47, #32, #30, and #18 did the mining in this area. Contracts #47 and #41 were mining from Raises #5618 and #5614 respectively. There was no particular extension of the ore body to the West under the hanging and the usual mining block was mined on the East side. Contracts #32 and #30, mining from Raises #5512 and #5516, mined the pillar remaining adjacent to the workings of the contract mentioned above. Contract #18 completed the mining to the South of Raise #5411 and thereafter mined an area Northwest to the main dike. A considerably larger lean ore area was encountered between the 5400 and 5500 series of raises, but whether it is a local jasper horse or not will be found when the next sub level is opened. This latter area is extremely wet and as it is fairly close to the jasper hanging, production has been very much handicapped by runs of loose rock and water.

In December Contract #18 completed the mining of a small pillar of ore North and East of Raise #5411 and commenced cutting the raise on the 40' sub level elevation. Contract #32 early in December finished mining a small pillar South of Raise #5512 and thereafter moved to the 5600 block on the 40' Sub Level. Contract #30 extended one slice to the South of Raise #5616 in an extremely wet area which has greatly slowed up mining operations.

40' Sub Level

During 1942 the 40' Sub was one of the most active in the mine and it might be said that one sub level of this size represents approximately one year's mining by the 5th Level contracts. Late in 1941 the 5500 series of raises had been opened to mining. From these raises a block approximately 200' in width was mined. The mining limit to the West was extended to reduce the size of the mining area from the 5600 series of raises due to the amount of maintenance necessary to continue operations from the 5600 drift as well as the raises. Four contracts were engaged in mining in this 5500 block. They include Contracts #23, #45, #24, and #10. This block is bounded on the East and West sides by mining limits which have been established some time ago.

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c. Stoping (Cont.)

40' Sub Level (Cont.)

The 5600 mining block was opened to mining by Contract #46 early in the year, in the vicinity of Raise #5626A. A considerable amount of water was encountered on the West side near the caved ground which is very near the jasper capping. During November a connection was made between Raises #5622, #5618, and #5614 and mining was started soon after. Practically all of the ore removed through the 5500 and 5600 series of raises was of special grade.

Contract #22 mined an area East of Raises #5636 and #5640 to the lean ore on the South footwall. Mining operations in this territory were completed in June.

Five contracts were engaged in mining in the South limb of the central ore body between the dikes which acts as mining limits in this territory, two to the Southwest and three to theSouth.

Contract #38 completed the mining of the remaining ore Northwest and West of Raise #5737 and early in July the gang moved to the 25' Sub Level.

Contract #33 also had a small remaining pillar North and East of Raise #5742. This area was mined early in the year and the contract moved to the 25' Sub Level during April.

In the small ore body divided on the North by dike and on the South by the Negaunee boundary, three contracts were engaged in mining during most of the year.

Contract #26 opened Raise #511 early in January and commenced mining from the East to the South and West with each slice encountering the lean ore footwall. A considerable part of this ore was lean in itself; however, by mixing this with the ore of other contracts it could be mined. Mining was concluded by Contract #26 in September, at which time the gang moved to the sub level below.

Contract #1 completed a connecting drift between Raises #509 and #510 in January of 1942. Mining was then started from the latter to the West continuing to the South. Thereafter a pillar was removed by the workings of Contract #26 on the East side and Contract #1 on the West side. Operations were finally concluded in December.

Contract #48 moved to Raise #509 in March of 1942 after completing the mining of a small pilar West of Raise #5640. Mining conditions in this new area were particularly bad due to more or less irregular mining on the sub level above when this area was still in its exploratory stage. All mining operations were directed to the Southeast of Raise #509 to the Negaunee Mine boundary and by September all available ore had been mined and Contract #48 moved to the 4th Level territory.

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c. Stoping (Cont.)

40' Sub Level (Cont.)

A brief description of the mining operations during December follows:

Contract #41 finished one drift and a slice to the dike North of Raise #5614.

Contract #32 commenced drifting to the Northeast of Raise #5618.

Contract #46 completed four slices and started a fifth Southeast and East of Raise #5622.

Contract #18 moved to Raise #5411 preparatory to mining.

All the above contracts are located in the Race Course Lease.

Contract #1 finished the mining of two small pillars South and East of Raise #510 by completing three slices. Late in December this contract moved to the 25' Sub Level located in the Maas Lease.

25' Sub Level

This level which is approximately 40' above the 5th Level was active during the second half of 1941.

Contract #43 had commenced mining at the South end of the 5500 block and were continuing North. In January, 1942, this contract were mining from Raise #5534 and during the year as the raise became crushed, the gang moved to new raises to the Northwest. During the course of the year, Contract #43 mined from Raises #5534, #5532, #5528, and #5526.

In July of 1942 Contract #22 commenced mining North and East of Raise #5636 between the 5500 block and the old workings under the jasper capping which were mined in 1940. This contract later moved to Raise #5638 and then to Raise #5640, where mining was continued under extremely wet conditions. In the area South of the dike five contracts were active during most of the year. Contract #38 continued mining from #5737 by drifting to the Northwest and slicing to the South. The first drift was extended to a distance of 140' from the raise, and with the extension of the ore a mining limit was set at a point 85' from the raise, at which future workings were stopped.

Contract #33 mined a large area West of Raise #5742 to the jasper capping and mining limit. In November Contract #33 completed the mining of this West side and continued to the South and East.

Contract #32 moved to Raise #5745 late in 1941 and completed the mining to the West and East of Raise #5745 in September.

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c. Stoping (Cont.)

25' Sub Level (Cont.)

Contract #24 moved to Raise #5645 after completing the mining in the 5500 block late in July. Mining operations were directed to the West and continued to the North.

Contract #26 opened the area Southeast of Raise #5111 for mining in September by completing a drift and two slices to the lean ore footwall East of the raise. A connection had previously been made by a drift and short raise West to Contract #1 at Raise #510.

A brief description of the December work follows:

Contract #23 completed a connecting drift between Raises #5524 and #5522 and were continuing on toward #5520.

Contract #43 completed two slices and started a third Southeast of Raise #5526. These two contracts are located in the Race Course Lease.

Contract #47 finished four slices and started a fifth North and East of Raise #5638.

Contract #22 extended three slices to the lean ore Southeast of Raise #5640 and late in the month commenced mining on the West side.

Contract #38 completed two slices Southwest of Raise #5737.

Contract #33 finished three slices East of Raise #5745 butting the workings of Contract #24 from Raise #5645 who had advanced Northwest of the raise and had started a second slice late in the month.

Contract #26 completed the mining of three slices to the lean ore footwall Southeast of Raise #511. For the most part this ore has proved quite lean.

The six above-mentioned contracts are located in the Maas Lease.

5th Level

During the entire year a considerable amount of repair work both to the drift and the raises was done in the 5600 Cross-Cut. This area not only is extremely heavy but has a large quantity of water which results from the breaking hangingwall which intersects the level approximately 70' to the West and comes out through the raises put up on the West side of the drift to control mining done previously under this hanging.

5th Level Winze

The 5th Level winze development which was started during the late months of 1941 was continued during the entire year. This drift is located parallel to the South end of the main shaft cross-cut and approximately 50' to the West.

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c. Stoping (Cont.)

5th Level Winze (Cont.)

Contract #4 completed the by-pass or winze drift to the main level in February and soon after stripped the drift to allow for a double track. A cut-out was made South of the winze location to accommodate the hoisting equipment in March and sinking operations were started in April with the setting of the bearers and raising for the shaft headframe. The timber headframe extends above the level approximately 34' and carries the cage compartment sheave as well as the sheave for the counterweight. In July sinking operations were underway with an advance of 60' during the month. Early in August the remaining 44' was completed with the total depth at 104' which is the same interval as that of the main shaft between the 5th and 6th Levels. In September work was underway in cutting out the 6th Level winze platform. This work was temporarily stopped while the mechanical equipment was being placed, and in October the crew moved to the main shaft where sinking operations continued.

Main Shaft

Preparations were made for the sinking of the main shaft during the middle of 1942 when several cuts were made in the ladder compartment of the shaft and adjacent to the rock pentice under which the shaft was to be sunk. The hoisting equipment was then installed and Contract #4 commenced sinking in October. It might be added that this gang was working under extremely adverse conditions. The opening through which the shaft was to be sunk was less than three feet wide and all rock had to be hoisted to the 6th Level by bucket where a transfer was made to a small car which was hoisted on a cage to the 5th Level and then into the pocket and the skip. The material through which the shaft was sunk was a very hard slate and quartz and the drilling operation often consumed from three to five shifts. By the end of December the shaft had been sunk to a depth of 82' and cutting out for room to accommodate the handling of the skip pit dirt will start early in 1943. Generally speaking, the work in both the winze and the shaft had progressed beyond expectations, particularly so when it was necessary to maintain constant production during the entire period and also when that production exceeded any former year.

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d. Timbering

Kind	Linear Feet	Price	Amount 1942	Amount 1941
6" x 8" Cribbing Timber	77,159	.0430	3,319.12	4,924.97
8" x 10" Stull "	138,511	.0729	10,100.49	8,402.85
10" x 12" " "	172,241	.1004	17,294.26	15,288.62
12" x 14" " "	68,349	.1467	10,031.91	7,889.93
Treated 12" x 14" "	990	.3607	357.13	5.94
Total Timber - 1942	457,250	.0898	41,102.91	
Total Timber - 1941	482,235	.0757		36,512.31
		Per 100'		
7' Lagging	2,430,050	.9683	23,529.15	16,370.83
9½' Poles	1,740,348	1.6511	28,735.11	20,901.65
Total - 1942	4,170,398		52,264.26	
Total - 1941	3,720,663			37,272.48
Wire Fencing - Sq. Ft.	35,466	.01178	418.00	1,326.94
Grand Total - 1942			93,785.17	
Grand Total - 1941				75,111.73

	Amount 1942	Amount 1941
Product, Tons	882,399	827,369
Feet of Cribbing & Stull Timber per Ton of Ore	.5182	.5829
Feet of Stull Timber per Ton of Ore	.4307	.4175
Feet of Lagging per Ton of Ore	2.7500	2.5500
Feet of Poles per Ton of Ore	1.9720	1.9470
Feet of Wire Fencing per Ton of Ore	.0401	.1080
Feet of Lagging per Foot of Timber	5.3144	6.1088
Feet of Poles per Foot of Timber	3.8061	4.6631
Cost per Ton for Timber	.0466	.0441
Cost per Ton for Lagging	.0267	.0198
Cost per Ton for Wire Fencing	.0004	.0016
Cost per Ton for Poles	.0326	.0253
Cost per Ton for All Timber	.1063	.0908
Equivalent of Stull Timber to Board Measure	990,583	981,096
Feet of Board Measure per Ton of Ore	1.1230	1.1860

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

Year	Amount	Cost Per Ton
1942	93,785.17	.1063
1941	75,111.73	.0908
1940	62,856.72	.0898
1939	53,010.66	.1023
1938	40,290.86	.0951

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d. Timbering (Cont.)

There was an increase in the cost per ton for timber, but not so much, however, as the increase in the average price per foot. The amount of timbering underground increased due chiefly to maintenance of main level drifts, where the mining was getting closer to the level and also in the 4th Level cross-cuts where there was excessive weight. The reduction in the amount of wire fencing used was due to the fact that it is no longer needed in the main ore areas where rock runs have been almost eliminated, but it is still used under new hanging until sufficient matt has been established.

e. Drifting and Raising

The following is a comparison of the drifting and raising in the years 1942 and 1941:

	Drifting		Raising		Total
Year	Ore	Rock	Ore	Rock	
1942	187	542	972	219	1,920
1941	1,328	621	1,882	531	4,362
Decrease	1,141	79	910	312	2,442

In addition to the above there was the following rock development under E & A CC 78:

Rock Drifting	Shaft Raising	Shaft Sinking
664	35	192

Although the ore and rock development that appeared on the cost sheet showed a material decrease, the amount of rock that had to be handled on account of the 6th Level development under E & A CC-78 greatly increased and decidedly reduced ore production in the latter part of the year when 26 men were employed on rock work. About one-half of the ore development and 90% of the regular rock development was on the 4th Level.

f. Explosives, Drilling and Blasting

Stoping and Ore Development

Kind	Quantity Pounds	Average Price	Amount 1942	Amount 1941
1¼ 50% Amonia Gel. Pwd.				616.00
1¼ 60% " " "	7,000	.1150	805.00	994.75
1¼ Gelamite 1	325,995	.1150	37,489.43	36,181.64
Total Powder - 1942	332,995	.1150	38,294.43	
Total Powder - 1941	328,873	.1149		37,792.39

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f. Explosives, Drilling and Blasting (Cont.)

Kind		Quantity Pounds	Average Price	Amount 1942	Amount 1941
Fuse	M Ft.	1,312,931	5.150	6,761.60	6,615.93
#6 Blasting Caps	M	193,908	12.20	2,366.84	2,348.96
Electric Blasting Caps	C	5,240	11.76	616.38	405.59
Powder Bags	ea.	115	3.73	429.08	463.98
Tamping Bags	M	20,000	4.33	86.55	108.40
Fuse Lighters	M	35,500	6.75	239.66	253.14
#18 2-Cont. Elec. Blast Wire		2,000	15.44	30.88	33.00
Master Fuse Lighters	M	1,000	20.05	20.05	39.70
Miscellaneous				94.80	25.20
Total Fuse, Caps, Etc.				10,645.84	10,293.90
Total All Explosives				48,940.27	48,086.29
Product, Tons				882,399	827,369
Pounds Powder per Ton of Ore				.3773	.3975
Cost per Ton for Powder				.0433	.0457
Cost per Ton for Fuse, Caps, Etc.				.0121	.0124
Cost per Ton for All Explosives				.0555	.0581

ROCK DEVELOPMENT AND FILLING

Kind		Quantity Pounds	Average Price	Amount 1942	Amount 1941
1¼" 60% Amonia Gel. Pwd.		2,250	.1150	258.75	517.50
1¼" Gelamite 1		54,955	.1150	6,319.82	1,538.36
Total Powder - 1942		57,205	.1150	6,578.57	
Total Powder - 1941		17,877	.1150		2,055.86
Fuse	M Ft.	36,678	5.150	188.89	193.89
#6 Blasting Caps	M	5,152	12.16	62.68	69.57
Electric Blasting Caps	C	2,787	12.06	336.17	1.90
Total Fuse, Caps, Etc.				587.74	265.36
Total All Explosives				7,166.31	2,321.22
Total Explosives Used at Mine				56,106.58	50,407.51
Average Price per Pound for Powder					.1150

Statement showing cost per ton for Explosives, exclusive of rock development, for the period 1938 to 1942:

Year	Cost per Ton	Production
1942	.0555	882,399
1941	.0581	827,369
1940	.0568	699,977
1939	.0555	517,899
1938	.0565	423,570

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h. Mining and Loading

In the past several years all of the product except that produced in raise development has been handled by electric scraper hoist units, of which there were 47 in service this year, varying in size from 15 to 25 h.p. In addition there were three 10 h.p. units which were used for exploratory purposes, skip pit clean-up, etc. There was one new 20 h.p. hoist purchased in 1942 and one 15 h.p. hoist scrapped, this unit being the first electric double drum hoist purchased at the Maas Mine in July, 1927, from the Sullivan Machinery Company. There were also four new single drum four-cylinder air hoists purchased to take the place of old 6 H.C. double drum air hoists which had been converted to single drum. At the end of the year there were 14 of these new type hoists in service for handling timber, cars, etc.

Approximately one-fourth of the contracts were mining under new hanging during the year and naturally progress was retarded while laying extensive covering of poles and wire and blasting filling to form a safe wall to work below. Extra men are employed to help out with this type of work, or sometimes the contract is moved elsewhere until the filling is completed. There was a very serious shortage of poles during the fall of 1941 when the wood roads became impassable and therefore during the spring and summer of 1942 all the available space was filled and although there was a very wet fall which caused a shortage of stull timber, there was sufficient poles and lagging to carry through. The shortage of stull timber was caused more by lack of man power in the woods all summer than by the poor roads in the fall.

There continued to be more contracts encountering seams of hard blue steel ore and also more of them experienced difficulty on account of water, especially in the areas under new hanging where there was not sufficient matt to prevent the water washing down the loose rock from above. To maintain a maximum product, such as we are striving for, it is necessary that a contract complete its cycle each 8 hours and as there are only a few more places available than the number of contracts required and these poorer areas have to be worked out, it means that the contracts in the good places have to do better than their cut per shift. Then a further handicap arose when the workings reached so close to the level that crushing occurred, making it difficult for the motor trains and also the raises were so short that they would not hold a full cut of dirt, which caused the contracts further delay. It is hoped that by the middle of next year a considerable number of the 4th and 6th Level raises will reach the workings above and be available for mining, thus giving all the contracts plenty of storage.

The contracts averaged approximately 18% of their time on repairing either their raises or the timber on tope of the raise which generally crushes once and sometimes twice before mining on one elevation is completed. The mine is continually showing more weight as mining descends and very rarely does a traveling and ventilation connection between two raises remain full size more than a couple of months and

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h. Mining and Loading (Cont.)

generally would close tightly in three to four months unless it was propped or repaired. The timbering on the main levels was much more excessive this year than ever before, as is reflected in the increased cost for timbering of .01 per ton despite the increased production.

The condition of the main line tracks, which was greatly improved last year, was under constant supervision during 1942, and the new drifts being advanced at present are carried wide enough to allow plenty of room for a ditch to carry off the mud and water and also allow for storage of timber on the sides. Both of these conditions affect the maintenance of the underground cars and locomotives and therefore a noticeable saving in repairs was effected this year.

i. Ventilation

The ventilation system at the Maas and Negaunee Mines, which are connected and served by one fan located at No. 2 Shaft, Negaunee, was very greatly improved this year by the installation of a new Jeffrey fan and air heating unit. There were new connections made between the two mines and the old ones enlarged which, together with two more connections in rock contemplated for 1943, makes an almost perfect set-up, as a considerable amount of the air comes direct to the Maas Mine without first passing through the Negaunee Mine active working places. Small fans have been used wherever necessary to take air from the main levels up into the sub levels, but generally this upper ventilation can be controlled by doors placed between the raises so that the air is forced up one raise, through the working places, and down to the level again further along. Two newer types of small 5 h.p. fans were purchased during the year as they work against a higher pressure and will produce a greater volume of air when their outlet tubes are constricted, due to crushing, than will the present type. There was also 1400' of 14" steel spiral riveted pipe purchased for use in ventilating the two headings on the 6th Level until such a time as a raise can be put up to the 5th Level. This pipe is generally carried some distance back of the heading and a fan installed at the front end, sucking the fresh air from the shaft and blowing to the breast through collapsible ventube. Another new feature introduced this year was that of collapsible bends to be used with the ventube in crushing ground and through raise sollars. These consist of a canvas tube protected by heavy wire wound spiral fashion outside the tube which partly prevents crushing and yet brings the tube back to full size as soon as the pressure is relieved.

j. Pumping

The amount of water pumped from underground, as shown by the main level wiers, was practically the same in 1941 and 1942, but the record as computed from pump logs showed a decrease of 80 gallons per minute in 1942 due to the pumps being in better condition and less leaks through the plungers. Underground conditions remained about the same, with perhaps a slight increase in the water coming

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j. Pumping (Cont.)

through the working places and less along the footwall. The new raises put up on the North footwall from 4th Level tapped so large an amount of water that it was not safe to cut out at the top, but it is hoped that one of the next three, now being put up, will be dry enough to start connecting all these raises. It will probably be necessary to put up two raises on the footwall, one at each end of this area and connect them by drifting along the footwall on one sub in advance of the workings on the hanging side, thus drying up the latter.

There was approximately the same amount of water pumped from the surface wells in the past two years and this amount just about equaled the amount pumped from underground. These surface wells are not very satisfactory, as the sand gets into the pumps and cuts them to pieces, necessitating their being removed and repaired once or twice per year. However, they do effect a reduction of approximately 200 gallons per minute in the water flowing underground and this is very worthwhile.

The number of gallons per minute pumped during 1942, 1941, 1940, 1939, and 1938 are shown below, as calculated by the Mechanical Department from the power consumption of the pumps:

Month	1942	1941	1940	1939	1938
January	997	1,347	1,370	1,565	1,240
February	1,004	1,187	1,339	1,525	1,442
March	1,017	1,126	1,382	1,339	1,367
April	1,029	1,105	1,386	1,430	1,379
May	1,035	1,105	1,411	1,327	1,545
June	1,068	1,096	1,434	1,290	1,372
July	1,095	1,106	1,380	1,224	1,438
August	1,111	1,104	1,321	1,356	1,391
September	1,069	1,157	1,245	1,397	1,434
October	1,065	1,148	1,276	1,385	1,644
November	1,046	1,150	1,280	1,434	1,408
December	1,051	998	1,318	1,370	1,496
Total Average	1,049	1,136	1,345	1,387	1,430

Following is the average number of gallons per minute as calculated from the underground wier readings and from the surface pumping for 1940, 1941, and 1942:

Year	1st Level	2nd Level	3rd Level	4th Level	5th Level	Total Undg.	Surface
1940	78	45	420	292	240	1,075	844
1941	76	19	334	276	223	928	975
1942	66	13	269	346	228	922	950

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8. COST OF OPERATING

a. Comparative Mining Cost

	1942	1941	Incr.	Decr.
Product	882,399	827,369	55,030	
Underground Cost	1.472	1.500		.028
Surface Cost	.136	.123	.013	
General Mine Expense	.246	.294		.048
Cost of Production	1.854	1.917		.063
Depletion - Original Cost	.126	.139		.013
Increment	.000	.000		
Depreciation-Plant & Equip.	.041	.044		.003
Development	.044	.049		.005
Movable Equip.	.000	.001		.001
Taxes	.108	.122		.014
Loading and Shipping	.051	.051		
Total Cost at Mine	2.224	2.323		.099
No. of Days Operated	296	304		8
No. of Shifts & Hours	1, 2 & 3-8	1, 2 & 3-8		
Average Daily Product	2,981	2,722	259	

COST OF PRODUCTION

	1942	%	1941	%	Incr.
Labor	1.266	56.9	1.235	64.4	.031
Supplies	.958	43.1	.682	35.6	.276
Total	2.224	100.0	1.917	100.0	.307

b. Detailed Cost Comparison
(1) Days and Shifts

Year	Days Worked	Shifts & Hours	Men Employed	Total Days Worked
1942	296	1, 2 & 3-8	498	141,245½
1941	304	1, 2 & 3-8	493	138,628½
Increase			5	2,617
Decrease	8			

During 1942 the mine operated 17 shifts per week except during the time of the break-down from March 24th to April 8th, and one extra shift on Sunday from May 9th to June 7th inclusive. The third shift was somewhat smaller than the other two, owing to there being no miners in the wet areas on that shift.

In 1941 there were 16 shifts operated per week to September 1st and 17 shifts per week for the balance of the year.

Total Men Employed in December of Each Year

	1942	1941	1940
Surface	74*	81*	71
Underground	456	422	388
Total	530**	503	459

*Includes 10 men on Company house repairs.
**Includes 13 men on payroll but home in December on account of sickness or injury, and 24 men working on E & A CC-78, 6th Level Development.

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b. Detailed Cost Comparison (Cont.)

(2) Wages

There was no increase in wages during 1942.

(3) Comparison of Production

Year	Production	Average Daily Product
1942	882,399	2,981
1941	827,369	2,722
Increase	55,030	259

The increase in production was due partly to increased efficiency and partly to cleaning up all of this year's stockpile overrun.

(4) Comparison of Number of Men & Wages

Year	No. Men	No. Days	Amount	Rate Per Day
1942	498	141,245½	1,068,160.26	7.56
1941	493	138,628½	996,301.79	7.19
Increase	5	2,617	71,858.47	.37

(5) Tons Per Man Per Day

	1942	1941	Increase
Surface	39.32	38.94	.38
Underground	7.43	7.05	.38
Total	6.25	5.97	.28

The slight increase in tons per man per day was again mostly due to credit for stockpile overrun this year, while 30,000 tons were left in stock last year.

(6) Cost of Production

1942	$ 1,636,020.54	Cost per ton 1.854
1941	1,586,005.77	" " " 1.917
Increase	$ 50,014.77	
Decrease		.063

	Total Cost				Cost per Ton		
	Labor	%	Supplies	%	Labor	Supplies	Total
1942	1,116,679.41	56.9	880,409.38	43.1	1.266	.997	2.263
1941	1,022,156.74	64.4	563,849.03	35.6	1.235	.692	1.917
Incr.	94,522.67		316,560.35		.031	.305	.336
Decr.		7.5		8.5			

(7) Detail of Accounts

	1942	1941	Increase	Decrease
Average Days per Week	6	6		
Shifts and Hours	1, 2 & 3-8	1, 2 & 3-8		
Production, Tons	882,399	827,369	55,030	
Avge. Daily Product, Tons	2,981	2,722	259	
Number of Days Worked	296	304		

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

	1942		1941		Increase		Decrease	
Underground Costs	Amount	Per Ton	Amount	Per Ton	Amount	Per Ton	Amount	Per Ton
1. Exploring in Mine	3,026.75	.003	1,145.48	.001	1,881.27	.002		
2. Development in Rock	12,001.92	.014	12,541.63	.015			539.71	.001
4. Development in Ore	9,476.50	.011	21,096.29	.025			11,619.79	.014
5. Stoping	466,621.59	.529	432,596.62	.523	34,024.97	.006		
6. Timbering	405,289.04	.459	371,747.39	.449	33,541.65	.010		
7. Tramming	141,669.51	.161	128,472.99	.155	13,196.52	.006		
8. Ventilation	15,447.84	.018	9,946.76	.012	5,501.08	.006		
9. Pumping	58,489.66	.066	62,685.45	.076			4,195.79	.010
10. Comp. & Air Pipes	65,140.82	.074	67,456.69	.082			2,315.87	.008
11. Back Filling	1,108.38	.001	856.60	.001	251.78			
12. Underground Supt.	30,034.27	.034	29,980.31	.036	53.96			.002
13. Cave-In	119.27	.000	511.77	.001			392.50	.001
14. Main. Compr. & Drills	1,506.26	.002	4,157.09	.005			2,650.83	.003
15. Scrapers & M. Loaders	46,073.65	.052	52,333.34	.063			6,259.69	.011
16. Elec. Tram Equipment	36,349.82	.041	37,947.38	.046			1,147.56	.005
17. Pumping Machinery	6,528.75	.007	7,774.70	.010			1,245.95	.003
Total Undg. Costs	1,298,884.01	1.472	1,241,250.49	1.500	57,633.52			.028
Surface Costs								
18. Hoisting	47,577.46	.054	41,519.63	.050	6,057.83	.004		
19. Stocking Ore	13,964.75	.016	14,100.47	.017			135.72	.001
20. Screening, Crushing at Mine	88.71	.000	913.63	.001			824.92	.001
21. Dry House	16,279.70	.018	10,586.09	.013	5,693.61	.005		
22. General Surface	9,989.68	.011	6,744.28	.008	3,245.40	.003		
23. Main. Hoisting Equip.	12,731.80	.015	13,815.51	.017			1,083.71	.002
24. Shaft	10.073.26	.012	2,146.15	.003	7,927.11	.009		
25. Top Tram Equipment	2,564.19	.003	2,887.61	.003			323.42	.000
26. Docks, Trestles & Pckts.	2,074.26	.002	2,420.13	.003			345.87	.001
27. Mine Buildings	4,340.31	.005	6,688.95	.008			2,348.64	.003
Total Surface Costs	119,684.12	.136	101,822.45	.123	17,861.67	.013		
General Mine Expense								
28. Insurance	6,119.57	.007	6,293.88	.008			174.31	.001
29. Mining Engineering	4,347.75	.005	5,146.67	.006			798.92	.001
30. Mech. & Elec. Engrg.	2,433.97	.003	2,477.72	.003			33.75	.000
31. Analysis & Grading	45,089.48	.051	39,002.86	.047	6,086.62	.004		
32. Personal Injury	15,240.70	.017	49,939.30	.061			34,698.60	.044
33. Safety Department	2,638.85	.003	2,511.94	.003	126.91	.000		
34. Tel. & S. Devices	3,069.23	.003	1,907.95	.002	1,161.28	.001		
35. Local and Gen. Welfare	6,893.10	.008	7,238.88	.009			345.78	.001
36. Sp. Exp. Pens. & All.	25,093.25	.028	12,924.44	.016	12,168.81	.012		
37. Ishpeming Office	26,149.28	.030	25,748.86	.031	400.42			.001
39. Mine Office	26,854.00	.031	23,684.43	.029	3,169.57	.002		
Social Security Taxes	27,585.25	.031	42,519.12	.051			14,933.87	.020
Employees Vacation	25,927.96	.029	23,536.78	.028	2,391.18	.001		
Total Gen. Mine Exp.	217,452.39	.246	242,932.83	.294			25,480.44	.048
Cost of Production	1,636,020.54	1.854	1,586,005.77	1.917	50,014.77			.063
40. Taxes	95,673.93	.108	101,324.64	.122			5,650.71	.014
Total Cost	1,731,694.47	1.962	1,687,330.41	2.039	44,364.06			.077

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

GENERAL

The accounts were almost evenly divided as to showing an increase or decrease, but the total shows an increase in amount due to more overtime shifts worked and a decrease in cost per ton due to larger production.

UNDERGROUND COSTS

3. Development in Rock

	Drifting	Raising	Total Feet	Cost Per Foot
1942	542'	219'	761'	12.10
1941	621'	531'	1,152'	10.36
Increase				1.74
Decrease	79'	312'	391'	

There was considerably less development in rock during 1942, as particular stress was being placed on the E & A for 6th Level development.

4. Development in Ore

	Drifting	Raising	Total Feet	Cost Per Foot
1942	187'	972'	1,159'	8.17
1941	1,328'	1,882'	3,210'	6.31
Increase				1.86
Decrease	1,141'	910'	2,051'	

There was very little drifting in ore during 1942 and fewer raises put up as they had been mostly completed in the present mining areas. There will be a decided increase in 1943 on 4th and 6th Levels.

5. Stoping

	Labor	Cost Per Ton	Supplies	Cost Per Ton	Total
1942	401,068.18	.455	65,553.41	.074	.529
1941	368,503.84	.446	64,092.78	.077	.523
Increase	32,564.34	.009	1,460.63		.006
Decrease				.003	

The increase in labor was due to working two overtime shifts on Saturdays in 1942 as compared with only one for the first eight months in 1941, while the slight increase in supplies was due to their higher cost in 1942.

6. Timbering

	Labor	%	Cost Per Ton	Supplies	%	Cost Per Ton	Total Cost Per Ton
1942	295,090.34	72.8	.334	110,198.70	27.2	.125	.459
1941	278,132.23	74.8	.336	93,615.16	25.2	.113	.449
Increase	16,958.11	2.0		16,583.54	2.0	.012	.010
Decrease			.002				

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

6. Timbering (Cont.)

The increase in both labor and supplies was due to there being considerable more retimbering of main levels done in 1942.

7. Tramming

	Labor	Cost Per Ton
1942	128,479.75	.146
1941	116,058.21	.140
Increase	12,421.54	.006

The increased cost of tramming was due to more overtime shifts for which pay and one-half was received.

8. Ventilation

	Cost	Cost Per Ton
1942	15,447.84	.018
1941	9,946.76	.012
Increase	5,501.08	.006

Increase was due to installing new fan and air heating unit at Negaunee Mine, making charges from Negaunee to Maas higher.

9. Pumping

	Surface		Underground		
	Gallons Pumped	Gals. Per Min.	Gallons Pumped	Gals. Per Min.	Total Cost for Power
1942	499,220,000	950	553,177,899	1,059	41,125.03
1941	512,460,000	975	595,237,587	1,145	44,934.20
Decrease	13,240,000	25	42,059,688	86	3,809.17

There was less water pumped both on surface and underground during 1942, although there was more rainfall in 1942 than in 1941. The surface pumping, however, continued to effect a saving in the total power consumed, as there was a decrease of nearly $11,000 as compared with 1940.

10. Compressors & Air Pipes

	Cu. Ft. Air Compressed
1942	1,703,655,000
1941	1,646,145,000
Increase	57,510,000

The increase in cu. ft. of air compressed was due to breaking more ore, necessitating more drilling, plus the extra drilling in the very hard rock in the shaft.

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

12. Underground Superintendence

	Cost	Cost Per Ton
1942	30,034.27	.034
1941	29,980.31	.036
Increase	53.96	
Decrease		.002

There was very little difference in this account in the two years, the decrease in cost per ton being due to a larger production.

14. Main. Comp. & Drills

	Cost	Cost Per Ton
1942	1,506.26	.002
1941	4,157.09	.005
Decrease	2,650.83	.003

Although there were eight sinking machines and three drifters purchased during the year, they were charged to E & A CC-78 and therefore there was only one stoper charged, as compared with eight drills and twelve jack legs in 1941. There was also a charge for repairs to the inter cooler in 1942.

15. Scrapers and Mechanical Loaders

	Cost	Cost Per Ton
1942	46,073.65	.052
1941	52,333.34	.063
Decrease	6,259.69	.011

Although there was one 20 H.P. Ingersoll-Rand Hoist purchased in 1942, there were less repairs to scraper hoist units in the Ishpeming Shops and therefore the total shows a decrease as compared with 1941.

16. Electric Tram Equipment

	Cost	Cost Per Ton
1942	36,349.82	.041
1941	37,947.38	.046
Decrease	1,597.56	.005

The decrease in the cost of tram equipment was due to the underground tracks being in better shape and therefore less wear on motors and cars.

17. Pumping Machinery

	Cost	Cost Per Ton
1942	6,528.75	.007
1941	7,774.70	.010
Decrease	1,245.95	.003

Decrease due to less repairs to underground pumps, but there were more charges to repairs to surface pumps that partly offset the decrease.

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YEAR 1942

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

SURFACE COSTS

18. Hoisting

	Total Ore & Rock	Power Cost	Cost Per Ton For Power	Cost Per Ton
1942	921,644	32,380.72	.0351	.054
1941	856,594	28,953.53	.0338	.050
Increase	65,050	3,427.19	.0013	.004

Increase in power cost due to hoisting more ore and rock in 1942.

19. Stocking Ore

	Tons Stocked	Amount	Cost Per Ton
1942	390,306	13,964.75	.016
1941	405,604	14,100.47	.017
Decrease	15,298	135.72	.001

The slight decrease in cost of stocking ore due less ore stocked and less work on dismantling and re-erecting trestles in 1942.

21. Dry House Expense	1942	1941	Increase
Coal Used in Heating Plant, Tons	1,217	872	345
Cost Per Ton for Coal	5.720	5.694	.026
Cost of Coal	6,974.64	4,965.13	2,009.51

The increase in cost due to more coal used, also more time in boiler house due to having watchmen spend all their time on policing property whereas formerly they had looked after boiler on afternoon and night shifts. Also there was a skip dump installed in 1942 to take care of the ashes.

22. General Surface

	Cost	Cost Per Ton
1942	9,989.68	.011
1941	6,744.28	.008
Increase	3,245.40	.003

Increase due mostly to having surface crew out on Saturdays on account of working two shifts requiring more timber etc. and this was all at time and one-half pay. Also more time spent on general improvements and changes in 1942.

23. Hoisting Equipment

	Cost	Cost Per Ton
1942	12,731.80	.015
1941	13,815.51	.017
Decrease	1,083.71	.002

Decrease due to less repairs to hoists, skips, and cages and one less rope purchased in 1942.

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

24. Shaft

	Cost	Cost Per Ton
1942	10,073.26	.012
1941	2,146.15	.003
Increase	7,927.11	.009

Increase due to accident in shaft March 24th. Repair crews working until April 8th. Mine started to operate April 8th.

25. Top Tram Equipment

	Cost	Cost Per Ton
1942	2,564.19	.003
1941	2,887.61	.003
Decrease	323.42	.000

Very little difference in cost for two years.

26. Docks, Trestles, & Pockets

	Cost	Cost Per Ton
1942	2,074.26	.002
1941	2,420.13	.003
Decrease	345.87	.001

Decrease due to Less work on pockets in 1942.

27. Mine Buildings

	Cost	Cost Per Ton
1942	4,340.31	.005
1941	6,688.95	.008
Decrease	2,348.64	.003

Engine house and office roofs renewed in 1942, but not as extensive repairs as in 1941.

28. Insurance

	1942	1941	Increase	Decrease
Property	3,061.76	2,835.90	225.86	
Group	2,192.07	2,717.11		525.04
Catastrophe	865.74	740.87	124.87	
Total	6,119.57	6,293.88		174.31

Property and catastrophe greater in 1942, but more than offset by decrease in group insurance.

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

29. Mining Engineering

	Cost	Cost Per Ton
1942	4,347.75	.005
1941	5,146.67	.008
Decrease	798.92	.003

Decrease due to less mine surveying, especially on stockpiles in the fall, as piles were almost cleaned up.

30. Mechanical & Electrical Engineering

	Cost	Cost Per Ton
1942	2,443.97	.003
1941	2,477.72	.003
Decrease	33.75	

Very little change in this account from year to year.

GENERAL MINE EXPENSEES

31. Analysis and Grading

	No. Determination	Lab. Expense Cost Per Determination	Analysis & Grading
1942	83,603	.371944	.539328
1941	77,431	.311463	.503711
Increase	6,172	.060481	.035617

Increased cost due to more determinations and more overtime paid. Determinations were increased due to having check samples at landing pocket. Also a larger proportion of samples underground required sulphur analysis.

32. Personal Injury

	1942	1941	Decrease
Compensation Department	869.93	951.30	81.37
Hospital Loss	7,968.92	9,949.62	1,980.70
Reserve & Catastrophe, Compensation set-up & Medical Service	6,401.85	39,038.38	32,636.53
	15,240.70	49,939.30	34,698.60

This large decrease was due to a different system of handling this account in 1942 when 2% of the payroll was used and credit allowed to meet actual expense only.

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YEAR 1942

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

33. Safety Department

	Cost	Cost Per Ton
1942	2,638.85	.003
1941	2,511.94	.003
Increase	126.91	

Slight increase due to more safety department expense.

34. Telephones & Safety Devices

	Cost	Cost Per Ton
1942	3,069.23	.003
1941	1,907.95	.002
Increase	1,161.28	.001

Increase mostly due to fire patrol on wee-ends and also to more equipment purchased.

35. Local and General Welfare

	Cost	Cost Per Ton
1942	6,893.10	.008
1941	7,238.88	.009
Decrease	345.78	.001

Decrease due to less aid to employees in 1942.

36. Special Expense, Pensions & Allowances

	1942	1941	Increase	Decrease
Saranac Invest.	2,749.35	3,152.73		403.38
Legal	518.96	507.12	11.84	
Pension	2,559.39	2,815.52		256.13
Miscellaneous	19,265.55	6,449.07	12,816.48	
	25,093.25	12,924.44	12,168.81	

Increase in miscellaneous is on account of collar to collar back pay and gift of $4,650 to City of Negaunee to help cover expenses.

37. Ishpeming Office

	Cost	Cost Per Ton
1942	26,149.28	.030
1941	25,748.86	.031
Increase	400.42	
Decrease		.001

Increase due to more expense in 1942.

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

39. Mine Office

	Cost	Warehouse Overhead	Cost Per Ton
1942	26,854.00	8,149.36	.031
1941	23,684.43	6,058.43	.029
Increase	3,169.57	2,090.93	.002

Increase in warehouse overhead due to Ishpeming office charges of interest on investments, also more salary expense in 1942.

Employees' Vacation

	Cost	Cost Per Ton
1942	25,927.96	.029
1941	23,536.78	.028
Increase	2,391.18	.001

Increase due to change in vacation set-up. In 1942 men working ten years or more received two weeks' pay, while in 1941 they had to have worked fifteen years. Also, they all received two hours per week more pay which was based on overtime at time and one-half.

40. Taxes

	Cost	Cost Per Ton
1942	95,673.93	.103
1941	101,324.64	.122
Decrease	5,650.71	.014

Analysis of Supplies Used

	1942		1941		Increase		Decrease	
	Amount	Per Ton	Amount	Per Ton	Amount	Per Ton	Amount	Per Ton
41. General Supplies	40,877.83	.047	50,228.04	.061			9,350.21	.014
42. Iron & Steel	14,264.87	.016	16,732.74	.020			2,468.07	.004
43. Oil & Grease	3,460.05	.004	3,674.19	.004			214.14	.000
44. Machinery Supplies	21,443.93	.024	36,695.08	.044			15,251.15	.020
45. Explosives	52,160.76	.059	50,183.33	.061	1,977.43			.002
46. Lumber & Timber	101,117.93	.115	81,124.50	.098	19,993.43	.027		
47. Fuel	7,295.51	.008	4,681.13	.006	2,614.38	.002		
48. Electric Power	147,232.75	.167	145,134.08	.176	2,098.67			.009
49. Sundries	25,824.68	.029	15,985.51	.019	9,839.17	.010		
50. Other Mines & Accounts	958.46	.001	755.85	.001	202.61			
Total	412,719.85	.468	403,682.75	.488	9,037.10			.020

While the total cost for all supplies was up 2%, the cost per ton was lower due to larger product in 1942. The largest increase was in timber, and this was partly due to a considerable increase in amount of repairing on main level drifts. Machinery supplies showed the most decrease in 1942 on account of purchasing less new equipment.

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9. EXPLORATIONS AND FUTURE EXPLORATIONS

A small high-speed "Gopher" drill was purchased from the Longyear Company, which operates by air power and uses Bortz bits instead of diamond and is capable of drilling up to 300'. Several holes were drilled at the Maas Mine during 1942 to test out small local formations where the ore had been cut off mostly by rolls in the jasper hanging and it was desirable to find out if any more ore existed before mining had descended too far. It was also used to drill across the formation below areas that were apparently pinching out to facilitate the placing of main level cross-cuts from which to reach the ore with the least amount of rock drifting. There is also some diamond drilling contemplated for 1943 to determine the extent of the ore below the 5th Level to the Southwest on the Pioneer and Arctic lands where if any exists it could be reached economically from the Negaunee shaft and thus keep that mine in production longer. Removing this ore through the Negaunee shaft would also maintain a larger production fro the next few years as the Maas shaft is operating almost at full capacity.

The detail of the various holes drilled in 1942 is as follows:

Hole #37

This was drilled S 44° E from #5022 Raise on the 75' Sub Level, 90' above the 5th Level, in the North footwall area to determine whether or not there was any ore existing behind the jasper adjacent to the raise. There was nothing but jasper found for 70' and so the hole was stopped as it evidently was in the true hanging and not a small roll.

The workings in the same area in the North footwall had been encountering jasper to the North and West for several sub levels and yet it was felt that there might be ore between here and the footwall as ore had been proved up on the 5th Level, which if not cut off by the hanging should exist at this elevation.

Hole #38

This hole on the same sub level was drilled N 32° W from the breast of the footwall cross-cut driven from #5022 raise and after passing through 15' of jasper cut 90' of ore before reaching the footwall. Work was immediately started to develop this ore and by the end of the year a considerable area had been outlined and in one place at least it was found to extend approximately 75' above this sub or 40' above the 4th Level.

Hole #39

The drill was then moved to the 4th Level and a test made on the footwall, below the stope which extended from the 215' Sub to the 3rd Level, in the hope that this ore body might exist between the dike and the footwall at this lower elevation (110'). There was, however, no ore encountered before reaching the footwall at 110' to the North.

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9. EXPLORATIONS AND FUTURE EXPLORATIONS

Hole #39 (Cont.)
It was then decided to determine if any ore existed above the 5th Level between the 5600 and 5800 Cross-Cuts, as both of these cross-cuts, although 500' apart, were in ore and yet the hanging had apparently been cutting off the ore just above the 5600 Cross-Cut and only 50' to the West.

Holes #40 and #41 were drilled in this area on the 25' Sub, 40' above the 5th Level from a raise in the South end of the 5800 Cross-Cut and several small runs of ore were proved to exist. In fact, hole #41 stopped in ore at 210' after cutting 50' of ore in the last run. The hole started to cave and it was not thought necessary to ream and case, as enough ore had already been found to make it worth while to advance a new cross-cut and start to mine this ore so as to establish a matt before the 6th Level raises were put up and thus avoid delay at that time.

Hole #42 was drilled to the Southwest from the end of the old 5700 Cross-Cut to determine if there was ore on the level on the other side of the dike where this cross-cut had been stopped several years ago. The ore was found immediately beyond the dike and it was therefore decided to advance this cross-cut to the South and develop this area.

Holes #43, #44, and #45 were drilled in the North footwall area on the 100' Sub, which had been developed from information proved in Hole #38. The ore had been found to extend some 100' to the West and it was desired to find out the width before the new 5th Level footwall drift, necessary to mine out this ore, could be properly located. These holes showed this ore body to be only about 40' wide and not extending to the Southwest beyond the present breast on the 100' Sub. Another small ore body was found, however, to the South, which was 50' wide at the point where Hole #43 crossed the formation and separated from the other ore body by 40' of jasper. No further drilling will be necessary here for some time as the raises from the new footwall drift can be used to develop this ore body until such a time as the jasper again cuts off the ore. The drill's use at the Maas Mine alone more than paid for its purchase and operating expense to date, as this ore would have been left behind and not found until all the adjacent ore had been mined down very close to the level and thus this area which is now proved to extend above the 4th Level would have been cut off from ventilation and might have necessitated a new rock drift to the North of the present working area

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10. TAXES

	1942 VALUATION	1942 TAXES	1941 VALUATION	1941 TAXES
Maas Mine	$ 3,285,000	107,344.60	$ 2,355,000	78,206.73
RaceCourse	610,000	19,933.09	700,000	23,247.16
Adams Strip	75,000	2,450.79	60,000	1,992.53
Stockpile & Equipment	580,000	18,952.78	690,000	22,914.08
Miscellaneous Parcels	8,860	289.56	8,860	294.35
Total Mine	4,558.860	148,970.82	3,813,860	126,653.85
Collection Fees		1,489.71		1,266.54
Total Oprtg. Maas Mine		150,460.53		127,920.39
Maas Area Leased to Negaunee Mine	1,585,000	52,311.30	747,908	25,086.40
Adams Strip Charged to Negaunee Mine	75,000	2,475.30	45,000	1,509.35
Total Charged to Negaunee Mine	1,660,000	54,786.60	792,908	26,595.75
Bal. Oprtg. Maas Mine	2,898,860	95,673.93	3,020,952	101,324.64
Total As Above	4,558,860	150,460.53	3,813,860	127,920.39

	1942 VALUATION	1942 TAXES	1941 VALUATION	1941 TAXES
Tax Rate		3.26772		3.32100
Total City of Negaunee Tax		480,690.32		483,653.74
Maas Mine % of City Tax		32.2%		27.6%
Maas Mine Rented Houses	105,700	3,471.44	144,200	4,788.98
Mineral Lands, Etc.	18,600	607.79	18,800	624.38
Total Proportion Five Houses Sold for Cash				150.64
Total Houses and Lands	123,300	4,079.23	163,000	5,564.00
Collection Fees		40.79		54.13
Total		4,120.02		5,618.13

11. ACCIDENTS AND PERSONAL INJURY

	1942	1941
Fatal	0	1
Time Lost, over 4 months	1	3
" " 1 to 4 "	7	10
" " less than 1 month	6	8
Total Accidents	14	22

On December 31, 1942, payments were being made on five accidents which occurred prior to January 1, 1942. Two were death claims and three were for permanent disability.

The total amount paid on compensation in 1942 was $7,292.36, as compared with $9,655.92 in 1941.

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11. ACCIDENTS AND PERSONAL INJURY

The following is a brief description of the lost time accidents:

Date of Accident	Name of Injured Man	Days Lost	Compensation Paid to 12-31-42	Description of Accident
3-18-42	Richard Pascoe	37	$111.00	Pascoe was picking a hitch to stand a leg when some dirt fell from between the covering, striking him on the back, causing fracture of three transverse processes of the spine.
3-14-42	Edward Larson	19	$ 39.00	Larson was picking down the loose dirt in the back when a chunk of ore fell on his left foot where he claimed he had a previous injury. He continued to work and got infection in his toe.
5-5-42	Cecil Bartle	155	$465.00	Bartle was sent a piece of timber up a raise and then went to the other side of the raise and started to clean track. The timber came loose, fell down on the rail and then glanced off toward him, and struck his left foot, causing a fractional dislocation of the heel.
5-16-42	Fenerd Granlund	22	$ 48.00	Granlund was carrying a plank and stepped into a depression between the ties, twisting his right knee, tearing a ligament.
6-19-42	Lee Sandstrom	36	$108.00	Sandstrom was putting up a prop when it slipped and caught his left arm between the prop and a leg, causing a fracture of the small bone.
6-24-42	Peter Marrietti	6		Marrietti was standing on the stage spiking a sprag and had some spikes in his left hand. His foot slipped and in attempting to regain his balance, he forced one of the spikes into his hand when it struck the sprag.
6-29-42	Edward Larson	60	$180.00	Larson and three others were lifting a cap when he caught his right thumb between the cap and the leg causing a fracture.
7-3-42	Arne Mattson	14	$ 24.00	Mattson and his partner were moving their puffer across the raise by its own power and when his partner applied the power it moved very quickly, catching Mattson between a timber and the hoist, causing a laceration of the left thigh.

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11. ACCIDENTS AND PERSONAL INJURY

Date of Accident	Name of Injured Man	Days Lost	Compensation Paid to 12-31-42	Description of Accident
7-17-42	Donald Staples	10		Staples was cleaning the ditch when he noticed he had a scratch in his left hand. He does not know when or how he received this and worked three days when infection set in.
8-24-42	Wm. Savolainen	35	$111.96	Savolainen was cleaning the bottom of the drift, preparatory to drilling when a piece of ore fell from the breast, knocking him down and the chunk fell on his left foot, fracturing the toe. It struck on the side and therefore the hard toe cap did not protect it.
9-28-42	Raoul Dompierre	10	$ 12.00	Dompierre was piling poles when one slipped from the pile, bruising his right foot and later infection set in.
11-19-42	John Rowse	Home	$ 54.00	Rowse was repairing the main level drift when a chunk of ore fell from the back, hitting on neck and chest and causing fracture of left clavicle.
11-25-42	Edgar Staples	10		Staples slipped and fell, striking his right thumb against the side and causing a fracture.
11-28-42	Edward Chevrette	Home	$ 54.00	Chevrette was helping to put up a leg when he slipped backward and his left foot slipped between two covering planks on top of raise. He then fell over, breaking his leg.

12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION

E & A No. CC-78

The purpose of this E & A was the development of the 6th Level by sinking the main shaft 86' for pocket and skip pit, drifting on the 5th Level, and sinking an auxiliary winze 1400' South of the main shaft and drifting and raising on the 6th Level. This E & A will be continued through 1943.

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION

E & A No. CC-78

Total Estimate		$ 187,660.00
Total Expended in 1941	$ 7,176.92	
Total Expended in 1942	61,981.18	
Total Expended to 12-31-42		69,158.10
Balance Dec. 31st, 1942		$ 118,501.90

The accounts are detailed as follows:

Sinking Shaft 80'

Total Estimate		$ 18,000.00
Total Expended in 1941	$ 650.94	
Total Expended in 1942	17,967.31	
Total Expended to 12-31-42		18,618.25
Balance Dec. 31st, 1942		$ 618.25

This account practically completed in 1942. Cost increased on account of deciding to sink 6' more than originally estimated.

Plat Pocket & Skip Pit

Total Estimate		$ 15,500.00
Total Expended in 1941	$ 1,556.79	
Total Expended in 1942	1,653.52	
Total Expended to 12-31-42		3,210.31
Balance Dec. 31st, 1942		$ 12,289.69

Rock Drift Shaft to Winze

Total Estimate	$ 25,200.00
Total Expended in 1942	642.28
Balance Dec. 31st, 1942	$ 24,557.72

Raise Winze 30'

Total Estimate	$ 3,000.00
Total Expended in 1942	1,186.44
Balance Dec. 31st, 1942	$ 1,813.56

Sink 102' in Winze

Total Estimate	$ 17,850.00
Total Expended in 1942	13,081.17
Balance Dec. 31st, 1942	$ 4,768.83

This account was also completed in 1942 with winze sunk 106' instead of 102'.

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION

E & A CC-78 (Cont.)

Rock Drift on 5th Level at Winze Location

Total Estimate for 250'		$ 4,500.00
Total Expended in 1941	$ 1,835.37	
Total Expended in 1942	4,580.61	
Total Expended to 12-31-42		6,415.98
Balance Dec. 31st, 1942		$ 1,915.98

This account was completed in 1942 and showed an overcharge because it was decided to put the winze further to the West of the new cross-cut and there was 400' of drifting instead of 250'.

Rock Drifting 2,500' Winze to Ore Body

Total Estimate	$ 45,000.00
Total Expended in 1942	5,643.57
Balance Dec. 31st, 1942	$ 39,356.43

Excavating for and Installing Hoist at Winze

Total Estimate	$ 1,600.00
Total Expended in 1942	2,956.56
Balance Dec. 31st, 1942	$ 1,356.56

This account was completed in 1942.

Trolley Wire and Rail Bonds

Total Estimate	$ 4,000.00
Total Expended in 1942	318.24
Balance Dec. 31st, 1942	$ 3,681.76

Rebuilding Cage for Use in Winze

Total Estimate	$ 1,000.00
Total Expended in 1942	864.02
Balance Dec. 31st, 1942	$ 135.98

This account was completed in 1942.

Electric Cables Carrying A.C. Current 1,400' Shaft to Winze, etc.

Total Estimate	$ 1,500.00
Total Expended in 1942	2,770.15
Balance Dec. 31st, 1942	$ 1,270.15

This account was completed in 1942.

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12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION

E & A CC-78 (Cont.)

Air and Water Lines

Total Estimate		$ 2,500.00
Total Expended in 1942		232.79
Balance Dec. 31st, 1942		$ 2,267.21

New Equipment

Total Estimate		$ 7,150.00
Total Expended in 1941	$ 2,989.47	
Total Expended in 1942	9,346.92	
Total Expended to 12-31-42		12,336.39
Balance Dec. 31st, 1942		$ 5,186.39

The overcharge was due to purchasing more equipment than originally estimated and also increased cost of remainder.

13. EQUIPMENT AND PROPOSED EQUIPMENT

a. Steam Shovels

There was very little delay due to repairs to steam shovels during the shipping season as the #45 or caterpillar shovel was given a thorough overhauling at the mine during the winter and the railroad type shovels Nos. #16 and #27 were repaired in the main shops in Ishpeming. There was very little stockpile loading after the first of September, as all but the wet ore had been cleaned up. The bull dozer, or Diesel tractor, was used very extensively in scraping the small rills of ore to the shovels.

b. Stocking Trestles

The Southeast and Southwest wooden trestles were dismantled and then re-erected during the shipping season, but the ore lying under the main West trestle was removed without disturbing the bents. There were no additional bents added to the rock trestle, as it was possible with the aid of the bull-dozer to scrape enough rock from below the trestle to allow for future stocking. The ore under the steel trestle East of the shaft was almost entirely removed and as there will probably be no ore of Bessemer grade produced, this space will be available for race course and Maas grades, thereby lessening the amount to be stocked on the Southwest and West trestles. There will also be more room for stocking wet ore that cannot be shipped directly from the pocket during the shipping season, but when allowed to stand from four to six weeks is then available for steam shovel loading.

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13. EQUIPMENT AND PROPOSED EQUIPMENT

c. Scraper Hoists

There was one new scraper hoist unit, a 20 H.P. Ingersoll-Rand, purchased during 1942, and one of the 25 H.P. units used for transferring ore was returned to the Athens Mine from which it had been rented. There were 39 15 HP. units, five 20 H.P. and three 25 H.P. in use at the end of the year. There are also three 10 H.P. machines which are available for skip pit ore, exploring, etc. There were four single-drum improved type air hoists purchased during 1942 for use in hoisting timber to the contracts and also for moving the main level cars at the auxiliary winze.

d. Cages & Skips

There were no changes in design in either the cage or skips in the main shaft and the skip estimated weight continued as 5.65 tons during the year. An old spare cage was rebuilt and together with a counterweight installed in the auxiliary winze between 5th and 6th Levels.

Three new hoisting ropes were installed, one on the cage and two on the skips during 1942. The previous ropes hoisted 280,000 and 246,000 tons respectively before they were removed.

On March 24th there was a very serious accident in the shaft when the North skip rope broke while the loaded skip was at the shaft collar, allowing it to fall 350', bending or breaking almost all the skip and skip-cage and cage-ladder road dividers for the entire distance. The falling skip broke out of the skip compartment, passed through the cage compartment and ended up in the ladder compartment, tearing out nearly all the interior casing, dividers, ladder road, etc. Fortunately it did not break the discharge column or the main power cable, although the main air line that runs alongside the afore-mentioned was broken in two places. Work was immediately started with three crews of six men each and a boss, besides the necessary shop and surface men and nearly all the work had to be done from a swinging stage hung under the cage, which fortunately was at the collar when the accident happened. Although the steel dividers were broken, they had to be cut off at the supports with a torch and measurements taken for new members. A long delay was avoided by having steel members on hand in anticipation of using them in the new part of the shaft below the 6th Level. It was very dangerous work as the shaft was open below and there was no wat to get down to build a permanent stage below the working place. There were 26 long steel dividers, 16 short dividers and 70 shaft runners replaced, as well as all the casing and ladder roads, and the job was completed on April 7th. There was no way of ascertaining at first what caused the accident, as the rope was in good shape, having hoisted 290,000 tons, and when tested after tha accident, was found to be good for 35 tons, but it would appear that the skip possibly

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13. EQUIPMENT AND PROPOSED EQUIPMENT

d. Cages & Skips (Cont.)

broke a runner on the last trip down and then jumped the track at this point when being hoisted. There was a mark near the collar which looked as though it had been struck by the skip when hoisting which probably caused the rope to break when it struck and allowed the skip to fall. There was an estimated loss of 36,500 tons while the mine was idle the two weeks. As an additional precaution, the shaft is now being inspected twice a week instead of one, but working 17 shifts per week does not give very much time for repairs and therefore only the worst places can receive attention.

e. Various Other Equipment

There were eight new rocker-dump, 65 cu. ft. capacity cars purchased during the year for use in the development of the 6th Level. There was a Jumbo Drill Mounting purchased for mounting three Cleveland D-12 Rock Drills, one of which was of the automatic type, so that time could be saved in rigging up. This is all mounted on a truck and is run into place as soon as the loader finishes loading the broken rock from the cut.

There were also three new ventilating fans purchased and a departure was made from the usual type of Anaconda "Sirocco" fans by purchasing one Coppus "Vent-Air" and one Jeffrey which both produce more air than the Sirocco against a higher pressure, and are being used to ventilate the two headings on 6th Level.

15. POWER

The following is the rate charged per K.W. hour by months during 1942.

January	$ .0134
February	.0128
March	.0130
April	.0142
May	.0128
June	.0130
July	.0130
August	.0130
September	.0128
October	.0128
November	.0130
December	.0130
Average 1942	$ .013067
Average 1941	$ .013067

17. CONDITION OF PREMISES

There was no work done about the grounds other than the routine work of keeping the lawns and shrubbery in good condition.

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18. NATIONALITY OF EMPLOYEES

As to Parentage	1942	%	1941	%
Finnish	212	40.0	223	43.2
English	97	18.3	95	18.2
American	93	17.5	71	13.7
Italian	49	9.2	52	10.0
Swedish	31	5.9	29	5.6
French (Canadian)	21	3.9	21	4.0
German	9	1.7	9	1.7
Norwegian	7	1.3	5	1.0
Danish	3	.6	4	.8
Irish	1	.2	2	.4
Austrian	4	.8	2	.4
Polish	1	.2	2	.4
Jugoslavian	1	.2	2	.4
Swiss	1	.2	1	.2
Total	530	100.0	518	100.0

As to Birth	Total		American Born		Foreign Born	
	1942	1941	1942	1941	1942	1941
Finnish	212	223	150	156	62	67
English	97	95	61	55	36	40
American	93	71	93	71	0	0
Italian	49	52	22	24	27	28
Swedish	31	29	25	24	6	5
French (Canadian)	21	21	21	20	0	1
German	9	9	7	7	2	2
Norwegian	7	5	6	5	1	0
Danish	3	4	3	4	0	0
Irish	1	2	1	2	0	0
Austrian	4	2	3	1	1	1
Polish	1	2	1	2	0	0
Jugoslavian	1	2	1	2	0	0
Swiss	1	1	1	1	0	0
Total	530	518	395	374	135	144
Percentage			74.5%	72%	25.5%	28%

19. MAAS CRUSHER

The following table shows the year's operations:

Mine	1942	1941	Incr.	Decr.
Cliffs Shaft	11,069	148,968		137,899
Morris (Inland)	24,470	1,564	22,906	
Maas	3,530	13,426		9,896
Negaunee	927	0	927	
Total	37,996	163,958		123,962

There was a decided decrease in the amount of ore handled through the Maas Crusher in 1942 due to not screening any Cliffs Shaft crushed, which accounted for the large tonnage in 1941. In the spring there was almost a complete removal of the pan conveyor when new links and shafting was put in. There were other minor repairs during the year, but which caused very little delay. The crusher operated only 25 shifts during 1942.

NEGAUNEE MINE
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1. GENERAL:

The Negaunee Mine operated on a seventeen shift per week basis during the entire year, five days on a three-shift schedule and two shifts on Saturday. Occasionally there was sufficient broken ore available for hoisting on the midnight shift on Saturday night.

Production in 1942 was 1,092,762 tons to which should be added 13,932 tons, the current year's stockpile overrun, making a total of 1,106,694 tons. The product exceeded by 73,474 tons the largest previous yearly production made in 1941. It should be borne in mind that the ore areas are decreasing in size due to encroachment of the footwall which made it more difficult to maintain the large product. All employees deserve great credit for their cooperation as the heavy working schedule subjects the men to great physical strain. Shipments in 1942 again broke all previous records and were 1,091,729 tons as compared with 1,051,006 tons in 1941.

Production from the area leased from the Maas Mine was much greater in 1942, amounting to 240,665 tons or 22% of the product for the year. Development of this area is still under way and will continue throughout the coming year.

Development is also underway for mining several small ore bodies known to exist above the 14th level in the area Southwest of the main ore body. This area is crossed by several small dikes at right angles to the main East-West dike which accounts for these small ore deposits found between and adjacent to the dikes.

The addition of several shift bosses and another Second Captain provided closer supervision and overcame to a great extent, the added hazard incurred on account of the rapid rate of mining, which does not allow sufficient time for the timber mat to settle and compact. There was one fatal accident in 1942 but it did not occur in the mining areas.

There were several breakdowns of equipment in 1942 but fortunately they did not cause long delays. More breakdowns are inevitable due to the heavy operating schedule which should be modified as soon as possible. It is almost impossible to keep the shaft properly repaired as the time at weekends for repairing is so limited. It is becoming increasingly difficult to get miners to work in the shaft on Sundays as they want and feel they are entitled to one days rest in seven.

The new Aerodyne ventilating fan of 120,000 cu. ft. capacity, which was installed at No. 2 shaft early in 1942, has materially improved ventilation in both the Maas and Negaunee Mines. The heating plant operated in cold weather in conjunction with the fan, has prevented the formation of ice in No. 2 shaft and the drifts and raises connecting to the 9th level which has permitted the full volume of air to circulate through the mine.

The district sawmill plant has been permanently located at the Negaunee Mine and the railroad tracks extended nearby so that carloads of logs can be unloaded at the mill. Dimension timber is sawed at the plant, oak and hardwood for tram car frames and timber trucks, hardwood strips for shaft runners, rollers, etc. In addition hemlock, pine and hardwood logs are cut into 1", 2", and 3" lumber. Small hardwood logs under usuable size for mine timber are cut into slabs which are used for covering down the floors of the sub levels.

NEGAUNEE MINE
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1. GENERAL: (Cont'd)

The heavy rainfall in October and early November disrupted hauling of timber, lagging and poles from the woods. To further aggravate the situation there has been more than the usual snowfall which has made constant plowing of woods roads necessary and also made skidding of logs to the haulage roads more of a problem. Stocks of timber at the mine are quite low in spite of every effort to relieve the shortage. A few weeks of settled weather with no snowfall would overcome the present acute shortage. Labor available for woods work is scarce due to the drafting of men and the lure of high wages on government jobs at Sault Ste. Marie, Escanaba, and at cities in the lower peninsula.

2. PRODUCTION
SHIPMENTS &
INVENTORIES

a. Production by Grades:

	1942	1941	Increase	Decrease
Negaunee Ore	866,029	970,675		104,646
Maas Lease	240,665	62,545	178,120	
Rock	34,550	61,420		26,870
Total Hoist	1,141,244	1,094,640	46,604	

b. Shipments:

	Pocket Tons	Stockpile Tons	Total Tons	Total Tons Last Year
Negaunee Ore	587,143	274,606	861,749	997,267
Maas Lease	181,192	48,788	229,980	52,380
Negaunee Special				1,359
Total 1942	768,335	323,394	1,091,729	1,051,006
Total 1941	664,834	386,172	1,051,006	
Increase	103,501	62,778	40,723	

Shipments increased 3.87% in 1942 and were 14,965 tons less than the product for the year.

c. Stockpile Inventories:

	Dec. 31 1942	Dec. 31 1941	Increase
Negaunee Ore	73,076	68,796	4,280
Maas Lease	20,850	10,165	10,685
Total	93,926	78,961	14,965

Including estimated overrun there were approximately 96,000 tons in in stock at the end of the year.

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2. PRODUCTION, SHIPMENTS & INVENTORIES: (CONT)

d. Division of Product by Levels:

	1942	Percentage	1941	Percentage
9th Level	280,806	25.7	235,857	23.2
11th Level			3,756	.3
12th Level	128,089	11.17	215,324	21.2
13th Level	656,939	60.1	553,537	54.5
14th Level	26,928	2.5	7,860	.8
Total	1,092,762	100.0	1,016,334	100.0
Current Years Skple Overrun	13,932		16,886	
	1,106,694		1,033,220	

The product from the 9th, 13th and 14th Levels increased while the 12th Level product decreased. Mining on the 12th Level will be completed early in 1943. The total production from the 9th Level since mining was resumed here in 1936 is now 880,705 tons.

e. Production by Months:

Month	Negaunee Ore	Maas Ore	Total Ore	Rock
January	74,239	13,735	87,974	2,985
February	64,005	15,639	79,644	2,965
March	74,983	18,221	93,204	1,875
April	76,412	19,095	95,507	3,850
May	76,137	18,174	94,311	3,495
June	78,553	22,849	101,402	2,280
July	72,444	26,125	98,569	1,935
August	68,867	25,455	94,322	2,800
September	65,978	20,347	86,325	3,395
October	72,106	21,910	94,016	2,965
November	64,930	18,814	83,744	2,840
December	64,930	18,814	83,744	3,165
Total	853,584	239,178	1,092,762	34,550
Current Years Stockpile Overrun	12,445	1,487	13,932	
Total	866,029	240,665	1,106,694	34,550
Total 1941	970,675	62,545	1,033,220	61,420
Increase		178,120	73,474	
Decrease	104,646			26,870

The product by leases was distributed as follows:

	1942	1941	Increase	Decrease
Negaunee Mine Co.	820,500	901,493		80,995
S 1/2 R. of Way	45,529	69,180		23,651
Maas Lease	215,745	58,871	156,874	
N 1/3 R. of Way	15,458	2,555	12,903	
N 1/6 R. of Way	9,462	1,119	8,343	
Total	1,106,694	1,033,220	73,474	

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2. PRODUCTION, SHIPMENTS & INVENTORIES: (CONT)

f. Ore Statement:

	Negaun ee Ore	Maas Lease	Total 1942	Total 1941
On Hand January 1, 1942	68,796	10,165	78,961	88,014
Product for Year	853,584	239,178	1,092,762	1,016,334
Stockpile Overrun	12,445	1,487	13,932	25,619
Total	934,825	250,830	1,185,655	1,129,967
Shipments	861,749	229,980	1,091,729	1,051,006
Balanc e on Hand	73,076	20,850	93,926	78,961
Increase in Output	104,628	178,120	73,492	160,523
Increase in Ore on Hand	4,280	10,685	14,965	9,053

1942 Five 3-8 hr. Shifts and 1-2-8 hr. Shift from 8-23-41

1941 Five 3-8 hr. Shifts from 1-1-41 to 1-25-41
Five 3-8 hr. Shifts and 1-8 hr. Shift 1-25-41 to 8-23-41
Five 3-8 hr. Shifts and 1-2-8 hr. Shift 8-23-41 to 12-31-41

g. Delays:

July 7th, 9 hours delay - Loss of Product - 1,430 tons

The axle of one of the headframe sheaves broke and it required seven hours to obtain and install another sheave. When the axle broke, one bearing was damaged and it also had to be replaced. A few hours later there was a two hour delay while the bolts holding the steel liners on the new sheave were tightened.

August 6th, 4 hours delay - Loss of Product, 660 tons

While hoisting from the 14th level, the South skip was loaded so quickly that the hoising engineer, did not have time to set his brakes. The empty North Skip at the dump in Shaft house was pulled up and wedged in the head frame. It required four hours to release the skip and make necessary repairs.

September 5th, 16 hours delay - Loss of Product, 2,475 tons

At various times prior to September, coils had burned out on the armature of the skip hoist motor. The 14th level is below the depth for which this motor was designed and heavy loaded skips are hard to hoist. The motor heats and fans have been installed in the engine house to cool the motor. A spare armature was on hand at the mine and it was decided advisable to remove the old armature on which several coils had been cut out and install the spare armature. This work was started on Saturday morning September 5th. and completed on Sunday night, September 6th.

October 16th, 1 hour delay - Loss of Product 132 tons

The key on the skip hoist drum worked loose and it required one hour to tighten it.

December 2nd, 3/4 hour delay - Loss of Product, 120 tons

This delay was due to a fuse on the top tram motor burning out.

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

g. Delays (Cont.)

December 7th, 1½ hour delay - Loss of Product, 275 tons
Putting on a new skip rope and later in the day cutting off 12 feet due to stretching of the rope, accounts for this delay.

In 1942 the total loss of product due to the delays enumerated above amounted to 5,092 tons as compared with 5,295 tons in 1941. The decrease of 203 tons was a good record in view of the increased production in 1942.

h. Delays from Lack of Current:

There were no delays from lack of current during the year.

3. ANALYSIS:

a. Average Mine Analysis on Output:

	1942				1941			
Grade	Tons	Iron	Phos.	Sil.	Tons	Iron	Phos.	Sil.
Negaunee Ore	866,029	60.03	.099	7.75	970,675	60.09	.101	7.87
Maas Lease	240,665	60.25	.107	7.74	62,545	60.14	.111	7.86

b. Average Mine Analysis on Straight Cargoes:

				Lake Erie	
Grade	Iron	Phos.	Silica	Iron	Moisture
Negaunee Ore	61.36	.093	6.21	61.16	11.63

4. ESTIMATE OF ORE RESERVES:

a. Developed Ore:

Assumption:

12 cu. feet equals one ton
10 % deducted for rock
10 % deducted for loss in mining
Percent of Bessemer - None

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4. ESTIMATE OF ORE RESERVES: (CONT.)

a. Developed Ore: (Cont.)

Area	Negaunee Lease	Leased from Maas Mine: S½ R of W or ⅔ of Adams Strip	Leased from Maas Mine: N 1/6 R of W or ¼ Adams Strip	Leased from Maas Mine: N1/3 R of W or C.C.I.Co. Strip	Maas Area	Total Tons	Special Grade Ore Maas Area
Above 9th Level	427,482					427,482	
9th to 10th level	41,063					41,063	
11th to 12th level	49,090					49,090	
12th to 13th level	453,891	94,021	8,576	18,697	262,012	837,197	
13th to 14th level	454,868	158,479	40,203	83,921	942,040	1,679,511	
Below 14th level	10,333	6,667		563	38,192	55,755	62,000
Total Gross Tons 11-30-42	1,436,727	259,167	48,779	103,181	1,242,244	3,090,098	62,000
Less 10% for Loss in Mining	143,673	25,917	4,878	10,318	124,224	309,010	6,200
	1,293,054	233,250	43,901	92,863	1,118,020	2,781,088	55,800
Less 10% for Rock	129,305	23,325	4,390	9,286	111,802	278,108	5,580
Net Total 11/30-42	1,163,749	209,925	39,511	83,577	1,006,218	2,502,980	50,220
Less December 1942 Production	62,941	1,989			18,814	83,744	
Total Developed Ore 1942	1,100,808	207,936	39,511	83,577	987,404	2,419,236	50,220*
Total Developed Ore 1941						2,851,655	
Decrease 1942						432,419	

(*) Not included in total of 2,419,236 on account of grade and also unavailable from Negaunee Mine.

The product from the Negaunee Mine, all leases in 1942 was 1,106,694 tons, deducting the decrease in estimate as compared with 1941, of 432,419 tons shows that 674,275 tons were developed in 1942. The increase occurs mainly in the area above the 9th level, the area above the 13th level and on the Maas Lease, Parcel No. 1 . Above the 9th the increase was due to more ore available in the caved stopes and extension of No. 2 shaft pillar beyond previous known limits. Between the 12th and 13th levels and on the Maas Lease the increase was due to the ore bodies extending beyond limits previously assumed, caused by flattening of the hanging wall jasper.

Including probable, ore (not in above estimate) there is approximately 3,250,000 tons to be mined as compared with 3,500,000 tons a year ago. The indicated probable life of the Negaunee Mine is from four to five years depending on the rate of production.

c. Estimated Analysis:

Ore Reserves: Approximate Expected Natural Analysis

Grade	Tons	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moist.
Neg. Ore	1,308,744	52.80	.092	6.86	.194	2.48	.700	.290	.018	1.832	12.00
Maas Ore	1,110,492	52.86	.102	7.18	.194	2.08	.503	.160	.018	1.330	12.00

The Negaunee ore includes the South one-half of right of way and the Maas ore includes the Maas Lease, the North one-third and North one-sixth of right of way.

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4. ESTIMATE OF ORE RESERVES: (CONT.)

c. Estimated Analysis: (cont.)

Ore Reserves: Approximate Expected Natural Analysis: (Cont.)

Grade	Tons	Iron	Phos.	Sil.	Mang.	Alum.	Lime	Mag.	Sul.	Loss	Moisture
Maas Spc.	50,220*	53.41	.066	5.29	.180	2.00	.520	.160	.184	1.40	12.80

(*) Not included in estimates.

Ore in Stock: Average Natural Analysis:

Grade	Tons	Iron	Phos.	Sil.	Mang.	Alum.	Line	Mag.	Sul.	Loss	Moisture
Neg. Ore	73,076	52.446	.087	7.33	.194	2.48	.696	.264	.018	1.83	11.90
Maas Ore	20,851	52.87	.102	7.18	.194	2.08	.503	.159	.011	1.32	11.80

5. LABOR AND WAGES

a. Comments:

There were 476 men on the payroll on December 31st, 1941 and 496 on December 31st 1942. During the year the number of employees increased 20. The turnover was the highest sice 1917 when the Country was also at war. During the year 39 men were drafted, 11 men enlisted, 40 men quit to take jobs at higher pay in the cities, 11 men were discharged for cause, 3 men were retired due to age, 2 men died, and 37 men were transferred to other properties. The total loss of employees was 143 men. During the year 160 men were hired. The efficiency of the new men is slightly below the average of former employees and to overcome this deficiency more men had to be employed. In the early part of the year a number of young men, 18, 19, 20 years of age, were hired, all of whom are now subject to the draft. Further loss of employees is inevitable both in this age group and also from older employees working at certain jobs such as timber hoisters, track cleaners, chutemen, and brakemen, that are classified as unskilled labor by the draft board. The Marquette County draft board has cooperated in deferring men engaged in operations that call for skilled and semi-skilled labor. These comprise miners, motormen, engineers and pipemen.

The labor situation at the end of the year was far from satisfactory. The organization of the employees known as The Marquette Range Industrial Union has lost many men who have signed up with the C. I. O. It seems certain that it is only a question of time until an election is held and the majority of employees signify that they want the C. I. O. to be the sole bargaining agent at the mine. This will unquestionably have far reaching results among which will be increased costs and less production due to lowered efficiency. This has been true of other companies where labor is controlled by this organization and The Negaunee Mine Co. can not expect to be an exception. More unrest and dissatisfaction over rates of pay had developed during the last two months than at any time in the past which condition is unquestionably due to the paid C.I.O. organizers working in the community. After the many years of peace and good relations with labor it is greatly regretted that this condition should develop especially so in time of war when maximum production is so vital to the war effort.

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5. LABOR AND WAGES: (CONT.)

b. Comparative Statement of Wages and Product:

Product	1942	1941	Increase	Decrease
No. Shifts and Hours	1,106,694	1,033,220	73,474	
	1-8 3	1-8 27		24
	2-8 50	2-8 24	26	
	3-8 255	3-8 252	3	
Average No. Men Working:				
Surface	80	73	7	
Underground	407	397	10	
Total	487	470	17	
Average Wages per Day:				
Surface	6.79	6.63	.16	
Underground	7.84	7.50	.34	
Total	7.67	7.36	.31	
Average Wages per Month:				
Surface	157.08	150.57	6.51	
Underground	183.50	167.05	16.45	
Total	179.16	164.44	14.72	
Product per Man per Day:				
Surface	49.83	51.26		1.43
Underground	9.68	9.84		.16
Total	8.10	8.26		.16
Labor Cost per Ton:				
Surface	.136	.129	.007	
Underground	.810	.763	.047	
Total	.946	.892	.054	
Average Product Mining:				
Stoping	22.17	21.88	.29	
Development in Ore	9.51	9.24	.27	
Total	21.67	21.63	.04	
Average Wages Contract Labor	8.30	8.23	.07	
Total Number of Days:				
Surface	22,207 3/4	20,135 1/4	2,072 1/2	
Underground	114,359 1/4	105,019 3/4	9,339 1/2	
Total	136,567	125,155	11,412	
Amount for Labor:				
Surface	150,797.53	133,555.68	17,241.85	
Underground	896,191.45	788,147.06	108,044.39	
Total	1,046,988.98	921,702.74	125,286.24	
Average Wages per Month as per Labor Statement - Less Captain and Clerks:				
Surface	154.62	149.74	4.88	
Underground	183.11	166.58	16.53	
Total	178.62	163.99	14.63	

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5. LABOR AND WAGES: (CONT.)

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

Proportion of Surface to Underground Men:

1942 1 to 5.09

Five 3-8 hour shifts and one 2-8 hour shift from 8-23-41 to 12-31-42

1941 1 to 5.44

Five 3-8 hour shifts 1-1-41 to 1-25-41.
Five 3-8 hour and one 1-8 hour shifts 1-25-41 to 8-23-41.
Five 3-8 hour and one 2-8 hour shifts 8-23-41 to 12-31-41.

6. SURFACE:

a. Buildings, Repairs:

Minor repairs were made to the coal dock trestle in April after it was inspected by the bridge engineer of the L. S. & I. Ry. Company. The walk-way on one side of the trestle was rebuilt as the old planks and rotted and were unsafe. A number of ties were replaced in the track from the coal pile to the heating plant.

A ventilation fan was installed under the roof in the East wing of the engine house in order to keep this wing cooler in the warm Summer weather. This wing contains the new Ilgner generator set, the motor of which caught on fire in 1941. The tunnel under the engine house in which the electric cables are installed was opened to the outside air and a small ventilating fan installed to keep the temperature in the tunnel at a safe level.

Erection of a building to house the new Aerodyne ventilating fan of 120,000 cubit feet capacity was started in November 1941 and completed in March 1942. This building houses the fan, a heating boiler, a bank of twelve large unit heaters, a coal bin of fifty tons capacity, and the necessary electrical equipment for the fan motor and thermostats. A large capacity stoker feeds fuel from the coal bin to the boiler. The heating units blow hot air into the intake of the fan to prevent the formation of ice in No. 2 shaft, the downcast airway. In previous below zero weather ice formed in the shaft and in prolonged cold weather it completely choked the airway. With the new installation good ventilation in the Negaunee and Maas Mines is assured at all times. In the Summer a concrete floor was installed in the boiler house. The entire fan house is as near fireproof as possible.

The district sawmill plant was moved from the Athens Mine in September and permanently installed at the Negaunee Mine. It was set up on concrete foundations and a building 20feet by 59 feet built to enclose the mill. The L. S. & I. Ry. Company tracks were extended 400 feet to the West of the timber yard to enable cars of logs to be unloaded at the mill. A small portable jammer was built and powered with an air puffer to facilitate the handling of logs. Dimension timber for timber trucks, top tram

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6. SURFACE: (CONT.)

a. Buildings, Repairs: (Cont.)

cars, etc., have been sawed for all the mines from oak logs. Clear maple has been sawed to proper dimensions for top tram rollers and strips for the skip road runners. In addition pine, hemlock, spruce, and hardwood logs have been sawed into one, two, and three inch plank. Due to the difficulty in buying lumber on account of war restrictions, the mill has proven very valuable. The slabs from all logs sawed have been used in the mines in place of tamarack poles for covering down sub level floors. The tamarack in the Northern Peninsula of Michigan and Northern Wisconsin will soon be gone and some substitute for the nine and one-half foot tamarack poles must be provided. The answer is unquestionably hardwood slabs sawed from under size hardwood logs. The tests made this year have demonstrated that the slabs provide excellent material for this purpose. The mill will be complete when a small hot water pond is provided for taking the frost out of the green logs and cleaning the sand from the rough bark.

The work of modernizing the dry house was completed in 1942 with the installation of a small shower room in the surface dry and the painting of the walls in this addition to the main building.

The addition to the mine garage for the Diesel Tractor, built in 1941, was painted in 1942.

An electric booster pump was installed on the main water line to the mine in a small concrete room below surface. This pump maintains forty pound pressure on the water main which assures an adequate supply for the shower room in the dry house. Before this pump was installed the water pressure was so low that it was impossible to regulate the mixture of hot and cold water at the shower with the result that constant complaints were made by the men when taking showers.

b. Fences:

To provide for greater safety from sabotage, a substantial fence eight feet in height was built to enclose an area adjacent to No. 2 shaft and the fan house. The fence is made with a fifty inch section of woven wire fencing and seven strands of barbed wire above. The only entrance is through a steel gate that is kept locked at all times.

At the end of Lincoln Street where the road to the mine starts, a nine foot fence was built to close off the mine grounds from the general public. Gates were not installed here but if conditons indicate a gate is necessary for safety, it can be installed on short order. This fence ties into the eight foot fence erected in 1941 to close off the caving ground.

Due to extension of the caving area near No. 1 old shaft on account of mining No. 1 shaft pillar, it was necessary to erect abount three hundred feet of new fence.

c. Tracks and Roads:

The L. S. & I. Ry. Company tracks to the timber yard extended four hundred feet to the West to a point near the sawmill to enable carloads of logs to be unloaded at the mill.

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6. SURFACE: (CONT.)

c. Tracks and Roads: (Cont.)

The ground adjacent to the sawmill was graded by the bulldozer and a road graded to connect with the main highway. An area three hundred feet in width located West of the shop building and South of the sawmill was also graded. After cutting down the sand hill and filling the low ground, a six inch surface of rock was spread over this area by the bulldozer.

Poles brought to the mine will be stocked here as also slabs from the sawmill. The mine timber track was then extended into this area for loading the poles and slabs on the mine timber trucks.

d. Stockpiles:

Loading from stockpile was completed on November 25th, the latest date on record. The tractor equipped with trail builder was used to clean up the ore on the stocking grounds when the last rill was loaded by the steam shovel.

d-1. Rock Trestles:

Three bents near the end of the rock trestle were repaired in July and brought up to grade. The end of the trestle is on caving ground and once or twice each year a few bents have to be raised to grade. The top twenty feet of the rock pile has been spread by tractor, which permits the continual use of the stocking trestle, otherwise another trestle would have to be erected in a new location.

In August two legs and one hundred new ties were installed on the permanent rock trestle to replace broken and rotted ones.

e. Shaft House:

Under this heading is grouped repairs made to the shaft house during the year.

In February and March a number of new steel lining plates were installed in the South loading pocket. The old loading chutes were torn out on account of rotting of timber framework and rebuilt. New plates were then installed in the chutes.

In April and May four new plates were installed in the chutes under the butterfly pocket replacing worn out plates.

In August and September, and November, new plates were installed in the skip dump pocket and new angles and wearing irons on the tracks guiding the skip into the dump.

During the year several new skip runners were installed above the collar of the shaft to replace worn out runners.

f. Water Supply:

The cost of water purchased from the City of Negaunee and used at the mine for the last seven years is as follows:

	1942	1941	1940	1939	1938	1937	1936
1st Quarter	203.17	140.27	125.41	113.48	80.08	55.86	67.61
2nd Quarter	341.84	266.62	170.24	116.83	75.04	61.20	59.77
3rd Quarter	602.21	392.20	261.10	136.78	115.15	56.70	83.64
4th Quarter	425.32	224.55	269.08	150.92	115.22	67.76	81.75
Total	1572.54	1023.64	825.83	518.01	385.49	241.52	292.77

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6. SURFACE: (CONT.)

f. Water Supply: (cont.)

	1942	1941	1940	1939	1938	1937	1936
Product-tons	1,106,694	1,033,220	865,689	551,362	412,000	820,915	512,712
Cost per ton	.001421	.000954	.000939	.000939	.000935	.000294	.000571

The cost for City water used at the mine increased again in 1942 and was the highest on record. The increase was due, to the larger product, more shifts worked and to the booster pressure pump installed in the early summer to maintain higher water pressure in the dry house.

g. Grounds:

The grounds around the mine were kept clean and in good condition throughout the year. The parking lot for cars of employees was enlarged and divided into separate parking areas for each shift. This permitted removal of snow after storms by the Diesel tractor, also better police protection to prevent theft of gasoline and tires.

7. UNDERGROUND:

a. Shaft Sinking:

There was no shaft sinking in 1942. The work of sinking from the 13th to the 14th level was completed in 1939.

b. Development:

There was a decrease in development drifting in 1942 and an increase in raising. The net decrease in footage of development work was 540 feet or approximately eight percent. In both 1942 and 1941 it was much above normal due to opening the 14th level and the Maas Strip area. The following table gives a comparison of the total feet of drifting and raising in ore and rock for the years 1942 and 1941.

	Drifting		Raising		Grand
Year	Ore	Rock	Ore	Rock	Total
1942	1244'	1639'	2152'	1332'	6367'
1941	532'	3893'*	1668'	814'	6907'
Increase	713'		484'	518'	
Decrease		2254'			540'

(*) In 1941, 2,835 feet of rock drifting included in the total of 3,893 feet, was charged to E. & A. No. 795 - "Development of the 14th Level". In 1942 all development expense was direct to operating cost.
/charged

On the sub levels above the 9th and on the 9th level there was only a small amount of development work in 1942. On seven different sub levels there were short rock drifts driven for ventilation connections to raises, to reach the ore from raises in the footwall and for exploration purposes. On the 9th level one raise was put up to mine the ore in No. 2 shaft pillar. An extension of the pillar to the West was found along the dike that forms the North boundary of the ore. The ore extended fifty feet above the sub level on which it was found and a new raise had to be put up to reach the top at the elevation of the old fourth level.

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7. UNDERGROUND: (CONT.)

b. Development: (Cont.)

Development of the tenth level for mining the ore in No. 1 shaft pillar that extends below the ninth level was started in November and one raise completed at the end of the year. Five raises will be required to mine this pillar which it is estimated amounts to approximately fifty thousand tons.

On the twelfth level the development work done in 1942 was confined to driving a new footwall drift to replace the present drift which must soon be abandoned on account of mining the ore body between the two dikes and the small ore body on the South footwall. In both these areas mining is now underway just above the old twelfth level drift.

On the 13th level and subs above, there was relatively little development work necessary in 1942. Two long ventilation drifts were driven on the sub levels to improve mining conditions. Two short raises and one long raise was put up from the main level.

Development of the 14th level was underway all the year. Drifting decreased in 1942 and raising increased as compared with 1941. The sump near the shaft was completed and also two cross-cuts on the Maas Strip. The Southwest main drift towards the West boundary of the property was extended over 350 feet but is not yet completed. During the year sixteen raises were completed and two were going up at the end of the year. The average height of the raises was approximately 150 feet as they extended to the second sub level above the 13th level.

b-1. Rock Development:

The following table gives a summary of the rock drifting and raising in 1942 and 1941:

	Drifting	Raising	Total 1942	Total 1941
9th Level	194'	195'	389'	120'
10th Level		26'	26'	
12th Level	405'		405'	71'
13th Level	455'	125'	580'	839'
14th Level	585'	986'	1571'	3677'
Total 1942	1639'	1332'	2971'	4707'
Total 1941	3893'	814'	4707'	
Increase		518'		
Decrease	2254'		1736'	

It is interesting to note that the decrease in 1942 was almost exactly equal to the increase in 1941 over 1940 or expressed another way, rock drifting and raising in 1942 was practically the same as in 1940. All three years were above normal due to development of the 14th level on the Negaunee Lease and the Maas Strip. The decrease occurs in rock drifting while rock raising increased.

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7. UNDERGROUND: (CONT.)

b-2. Ore Development:

The following is a summary of ore development in 1942 and 1941:

	Drifting	Raising	Total 1942	Total 1941
9th Level	34'	110'	144'	63'
10th Level		89'	89'	
12th Level				53'
13th Level	119'	169'	288'	1325'
14th Level	1091'	1784'	2875'	759'
Total 1942	1244'	2152'	3396'	2200'
Total 1941	532'	1668'	2200'	
Increase	712'	484'	1196'	

Both drifting and raising in ore increased in 1942 due to development of the 14th level on the Negaunee Lease and the Maas Strip. A portion of the development work was in the small, hard ore body on the South footwall between the 13th and 14th levels which was developed by small mill raises and drifts for sub level stoping.

c. Stoping:

(1) General:

The product from the Negaunee Lease was obtained from the same areas as in previous years, with one exception, viz., the area on the South footwall between the 13th and 14th levels where sub level stoping is underway. Above the ninth level the main product came from No. 1 shaft pillar, the adjoining pillars and stopes filled with caved ore, and a small product from No. 2 shaft pillar. The ore mined above the 12th level came from the small pillar on the Maas boundary, from the ore body between No. 1 and No. 2 dikes near the South footwall, and from the small ore body on the South footwall. Below the 12th level the ore came from the main ore body and from the Maas Strip with a small product from an area South of the main East-West dike and from the area opened for sub level stoping on the South footwall below the 13th level.

Ore mined from the Maas Lease, Parcels 1, 2, and 3, increased from 6% of the product in 1941 to approximately 22% in 1942.

The locations of the mining contracts at the end of the year 1942 and 1941 are given below:

	1942		1941
	10 above 9th Level		11 above 9th Level
	1 above 10th Level		0 above 10th Level
	4 above 12th Level		4 above 12th Level
	10 above 13th Level		20 above 13th Level
	14 above 14th Level		6 above 14th Level
Total	39	Total	41

The thirty-nine contracts working in December 1942 were divided into thirty-four mining and five on development work.

During 1942 ore was mined in No. 2 shaft pillar on the 777', 756', 747' and 720' sub levels, in No. 1 shaft Pillar and adjoining stopes and pillars on the 773', 764' 756', 733', 720', 710', 673', 663', 653', 640' and 630' sub levels. The total number of sub levels on which mining was done above the ninth level in 1942 was fifteen.

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7. UNDERGROUND: (CONT.)

c. Stoping: (Cont.)

(1) General: (Cont.)

On the sub levels above the 12th level ore was mined on four sub levels, viz., the 360', 350', 335' and 325'.

Above the 13th level ore was mined on the 285', 270', 260', 250', 235' and 220' sub levels.

Above the 14th level and up to the second sub above the 13th level ore was mined on the 220', 210' and also in the stope on the South footwall that extends to the 235' sub level elevation.

Summarizing the above shows ore mined on twenty-seven different elevations in 1942, as compared with thirty in 1941. More contracts are located on a few sub levels just above the 13th level on the Negaunee Lease and the Maas Strip than were in these areas a year ago due to opening more territory for mining.

(2) Detail of Stoping:

Subs Above the Ninth Level

No. 2 Shaft Pillar

Mining of the North portion of No. 2 shaft pillar was completed in 1941 and in 1942 was confined to the South portion of the pillar. One contract worked in this area all the year except for two months while a development gang was putting up a new raise into this area. While mining on the 720' sub level the ore was found to extend beyond the jasper at one point near the dike which defines the Northern boundary of the ore body. A transfer raise located ninety feet West of No. 915 raise was put up to the 747' sub level where the ore was found to extend 130 feet further to the West. An exploratory raise forty feet back from the West end of this drift disclosed that the ore extended to the 777' elevation or the old fourth level and exploratory drifts at this elevation proved up a small area that had not been mined by the former operators when they were working here prior to 1900. Accordingly a new raise, located in an old ninth level cross-cut, was put up to this area and mining started. By the end of 1942 an area sixty feet by one hundred twenty feet had been mined with the South limit of the ore pillar not yet reached. Old maps show a few pillars and stopes in this area at one lower elevation. It is evident that mining was started here years ago and abandoned after opening square-set stopes that were only one set or ten feet high. The ore pillar above has not caved and it is posible the old stopes are still open. The new raise put up here proved that the ore pillar was about ninty feet in thickness from foot to hanging. It is only large enough for one contract andfrom present indications it will provide a working place for the contract for more than one year.

No. 1 Shaft Pillar and Adjacent Pillars and Stopes

This ore area was mined on eleven different elevations during 1942. Ten contracts worked here during the entire year. Seven contracts worked in the area South of the East-West dike that crosses the pillar and three gangs North of the dike. The main ore area lies South of the dike where mining directly above the footwall is still underway 150 feet above the ninth level. Five gangs mined the ore at the highest elevation above the ninth. One gang finished mining on the 773' sub in January and

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7. UNDERGROUND: (CONT.)

c. Stoping: (Cont.)

No. 1 Shaft Pillar and Adjacent Pillars and Stopes: (Cont.)

moved down to the 764' sub level where four gangs were mining the first of the year. The ore area on the 764' sub level was approximately 400' by 175' in size. The old stopes in this area on each side of the main shaft pillar are filled with wood and caved ore. The wood came from the timber and lagging used in the old square-set rooms. It interfers somewhat with production as it has to be picked out and thrown into the completed slices. When two of the raises from the ninth level were put up several years ago it was noted that sulphur in the form of Calcium Sulphate or Gypsum occurred in the ore for a distance of thirty feet or more directly above the footwall. The sulphur was not uniform, the maximum noted being about .250 while normal for the mine was .010. It was first noted in the stope samples when mining was started from these raises on the 764' sub level. When mining on the new lower sub or the 756' in the last months of 1942 the sulphur ran from .025 to .250 in the ore mined on the footwall side of the two raises. Due to the large production from the Negaunee Lease it was possible to mix this ore with the product from the mine and keep the sulphur within permissable limits. The occurrance of sulphur in the Negaunee ore is so unusal that comment is made. It is confined to a relatively small area, approximately 160 feet by 80 feet in size, where the footwall has flattened and as mining progresses to lower elevations it drops back to normal to .010. At the end of the year mining was 60% completed on the 756' sub level.

North of the dike a small area was mined on the 733', 720' and mining nearly completed on the 710' sub at the end of the year. One contract worked here all the year. This area is decreasing in size due to encroachment of the footwall on the Northeast side. It is located at the Northwest corner of the shaft pillar area and on the sub being mined at the end of the year was approximately 130 feet by 50 feet in size.

The main shaft pillar has been mined North of the dike by two contracts all the year. Mining was 50% completed on the 673' sub level the first of the year and during the year mining was finished on this sub level, also on the 663' sub level and 90% completed on the 653' sub. Mining here is now only 43 feet above the ninth level and only one or two more subs can be mined from the ninth level. The balance of the pillar will be mined from raises put up from the 10th level in 1943. The area mined here in 1942 averaged about 160 feet by 140 feet in size and was somewhat larger than in 1941 due to the advance of the hanging jasper to the West while the dike that forms the East boundary continues nearly vertical.

An area South of the dike, near the Southwest corner of the stopes and pillar area, was mined by two contracts during the entire year. Mining was started here in 1941 on the 690' sub level directly under the jasper hanging. By the end of 1941 mining had nearly been completed on the 663' sub level. In 1942 the balance of the ore on this sub level was mined, also mining was completed on the 653', 640' and nearly completed on the 630' sub level. When mining started in this area a limit of mining was set and followed on each sub level. When mining had progressed down to the 640' sub level the jasper footwall had encroached beyond the limit of mining and decreased the size of the area. The 630' sub is the last one that can be mined above the ninth level. The balance of the triangular or wedge shaped pillar will be mined from two 10th level raises, one of which was completed at the end of the year.

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7. UNDERGROUND: (CONT.)

c. Stoping: (Cont.)

(2) Detail of Stoping: (cont.)

9th Level

In 1942 one raise was put up from the ninth level to mine the ore in No. 2 shaft pillar that was found to extend 170 feet above the ninth level. This raise, No. 914, was located in an old ninth level cross-cut where considerable repair work had to be done before the raise could be started. The raise was 196 feet in height on an angle of 68 degrees. It was advanced 103 feet in the footwall and 93 feet in ore. There was no drifting on the ninth level in 1942.

10th Level

This level was reopened for operating in the latter half of the year. The old loading pocket at the shaft which was badly rotted was torn out and rebuilt. Haulage tracks were repaired and new forty pound rail installed on the shaft plat. The trolley wire was overhauled and lights installed at the shaft and on the level. Ditches were cleaned and timber sets repaired where needed. In November preparations for putting up one raise were completed and the raise started. It was completed the last of December to the second sub level above the ninth level at a height of 130 feet, 36 feet in rock and 94 feet in ore. This raise was located on the South side of the dike which area is being mined a short distance above the ninth level elevation. The next raise to be started early in January will be located to strike the same ore pillar on the footwall side. A total of four additional raises are planned, all of which will be put up in the early months of 1943. Five raises will be needed for mining the ore in No. 1 shaft pillar from the second sub above the ninth level to the point where the footwall cuts out the ore at its junction with the area that was mined many years ago.

11th Level

Mining was completed on this level early in 1941.

Subs Above the 12th Level

North Footwall Pillar

Mining of this pillar located on the boundary line of the Maas property was completed in 1942 by one contract. It was cut off by the footwall intersecting the mined area to the South. Abount 50% of the ore on the 360' sub level was mined in 1941 and mining was finished on this sub in March 1942. Mining was started on the 350' sub level in March and completed in April. The flat pitch of the footwall reduced the ore area almost one-half on this sub level. The 340' sub level was opened in April and mining completed in May. The footwall was exposed in the bottom of the slices showing that the ore was cut out entirely at this elevation. This completed mining of this pillar and the contract was moved to a new location.

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7. UNDERGROUND: (CONT.)

c. Stoping:(Cont.)

(2) Detail of Stoping: (Cont.)

Ore Body Between No. 1 and No. 2 Dikes

About 60% of the ore on the 360' sub level was mined at the end of 1941 and the balance was removed in April 1942. In the last eight months of the year mining was completed on the 350', 335' and well advanced on the 325' sub level at the end of the year. Two contracts worked in this area during the entire year. This ore body is decreasing in size quite rapidly due to No. 1 and No. 2 dikes joining to form one dike just below the 12th level elevation. The footwall is quite flat between the dikes which also decreases the ore area on each succeeding sub level. Mining will be completed here in 1943.

Ore Body on South Footwall South of No. 1 Dike

Mining of this small ore body by one contract was continued during 1942. During the year mining was completed on the 350' and 335' sub levels, and 80% completed on the 325' sub level in December. The ore body averaged about 150 feet in lengh and 75 feet in width. That portion directly above the old haulage drift on the 12th level can not be mined until a new haulage road back in the footwall is completed in January 1943. It is known that this small ore body is cut out entirely by jasper a short distance below the 12th level. It, however, has been developed again at a lower elevation several hundred feet further to the West. The remainder of the ore above the 12th and the small extension below the 12th will be mined by a transfer drift and raise on the 260' sub level elevation. This transfer drift was started late in December 1942 from a 13th level raise located North of the dike and will be completed in January as also the raise from the 260' sub to the 325' sub level elevation where a portion of the sub level directly above the old 12th level haulage drift remains to be mined. It is probable that this ore body will provide a working place for one contract during all of 1943.

12th Level

The only work done on the 12th level in 1942 was the driving of a new footwall drift to replace that portion of the old drift that will shortly have to be abandoned on account of mining the small ore bodies between No. 1 and No. 2 dikes and also the ore body on the South footwall. The new drift was started in October and by the end of the year had advanced 405 feet in footwall slate and jasper. At the end of the year the drift had to advance 115 feet to completion.

SUbs Above the 13th Level

The sub levels above the 13th level provided the major portion of the product in 1942. Work was done on six sub levels in the main ore body and on four sub levels in the Maas Strip area. In addition, two small areas South of the main ore body on the Negaunee Lease Produced asmall amount of ore. In several areas mining has approached the 13th level elevation and the ore is now going to the 14th level as the 13th level drifts can no longer be used due to crushing.

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7. UNDERGROUND: (CONT.)

c. Stoping: (Cont.)

(2) Detail of Stoping: (Cont.)

Main Ore Body: (Cont.)

Four separate areas were mined in the main ore body in 1942. The highest area, comprising a pillar on the North footwall adjacent to the Maas boundary approximately 100 feet by 120 feet in size, was mined by two contracts on the 285', 270' and 50% mined on the 260' sub level at the end of the year. An area South of this pillar was mined on the 270', 260' and nearly completed on the 250' sub, and the 235' sub was being developed at the end of the year. This area is approximately 200 feet by 260 feet in size. It is decreasing in size on each succeeding sub level due to advance of the footwall. Early in the year three contracts were working on the 270' sub level and five on the 260' sub level in this area. At the end of the year two contracts were mining on the 250' sub level and three contracts on the 235' sub level. Three of the eight contracts employed here early in the year have been transferred to other areas due to decrease in size of the ore pillar. The mass of hanging wall jasper that cut off a portion of this ore pillar near the Maas boundary has receded. This partially offset the loss due to the advance of the footwall.

The third area being mined in the main ore body immediately to the Southwest of the large area referred to in the previous paragraph was mined by two contracts on the 235' sub level elevation. The dropper of jasper hanging in this area is receding quite rapidly and the ore area being mined here has increased in size. After finishing mining on this sub level, the 220' sub level was developed for mining from four raises from the 14th level and mining was nearly finished here by three contracts at the end of the year. One of the contracts had moved down and started to mine on the 210' sub level. The ore area here at the elevation of the 220' sub level is 280 feet in length adjacent to the Maas boundary and 240 feet in width from the footwall to the Maas boundary. Now that the jasper dropper on the hanging has practically receded to the Maas boundary the ore area will decrease on each succeeding sub level due to the advancing footwall.

The Southwest end of the main ore body along the dike near the point where the dike crosses over to the Maas property was mined on the 260', 250' and 80% mined on the 235' sub level during the year by two contracts. This area was 240 feet in length by 80 feet in width. One raise from the 14th level to this area is now in use by one contract which is opening the 220' sub level. Another 14th level raise has been completed to the 220' sub level and will be used as soon as mining is finished on the 235' sub level.

The main East-West dike formed by the junction of No. 1 and No. 2 dikes a short distance below the 12th level splits again into two dikes at about the same elevation 380 feet further to the West. A crosscut on the 13th found ore in the crotch between the two dikes and raises reached the jasper hanging at the elevation of the 260' sub level. A small area was mined on this sub level in 1941 and an increasingly larger area on the 250' sub level and partially mined on the 235' sub level. In 1942 mining was completed on the 235' sub, on the 220' sub, and 75% on the 210' sub at the end of the year. The ore area increased from 50 feet by 12 feet on the 260' sub, to 300 feet by 40 feet on the 210' sub level. The West end of this small area is cut off by a North-South

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7. UNDERGROUND: (CONT.)

c. Stoping: (Cont.)

(2) Detail of Stoping:(Cont.)

Main Ore Body: (Cont.)

dike and on the 210' sub jasper was encountered for the first time near the junction of the two dikes. This jasper will advance Westward on the pitch of the ore trough between the dikes and cut off the ore a few sub levels below the 13th level. Two contracts were working here at the end of the year, although only one contract mined the ore on the 235' sub level earlier in the year.

A small area 45 feet by 25 feet in size, 350 feet Northeast of the West boundary of the Negaunee property was mined on the 13th level elevation the last of the year. Ore was found here several years ago when the 13th level was developed for mining. A raise showed that the ore extended only 15 feet above the 13th level. The ore was found West of a North-South dike partly on the American Mining Company or South one-half of the Adams strip, and on the Negaunee Lease. Another dike striking Southwest and Northeast bounds the ore on the South side with jasper hanging on the West. A very small tonnage is expected from this small deposit and mining will be completed here in 1943. The ore body will however, be somewaht larger on lower sub levels as the dike dips to the Northeast and the jasper to the Southwest. The ore is mined from a 14th level raise.

Sub Level Stope Above 14th Level

Two hundred feet Southeast of the small deposit described in the preceding paragraph, development work from a 14th level raise disclosed an ore body near a dike striking Southeasterly. This ore body was adjacent to the South footwall. The ore was entirely different from any ore heretofore found on the Negaunee property. It is quite hard and full of water courses and vags. It can not be drilled with auger steel, and leyner water drill machines and sinker machines were used to develop it. It was first developed by a North-South drift on the 160 foot sub level and again cross-cut on the 13th level elevation. On account of the hardness of the ore it was decided to mine it by the sub level stope system. Accordingly, eight mill raises were put up from the cross-Cut on the 160 foot sub level and connected at 20 foot intervals above the 13th. At the end of the year the ore had been developed to a height of 60 feet above the 13th level. The top sub level was 45 feet above the 13th level. Stoping had been started an an area 75 feet North and South by 90 feet East and West mined to the hanging. The stope will eventually be somewhat larger as the ore continues to the North. One contract has been stoping for several months and one contract has been putting up mill raises and connecting them with dogdrifts at 20 foot vertical intervals. Due to the hardness of the ore the cost per ton have averaged about the same under this method of mining as in top slicing in the balance of the mine.

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YEAR 1942

7. UNDERGROUND: (CONT.)

c. Stoping: (Cont.)

(2) Detail of Stoping: (Cont.)

Subs Above the 13th Level

Maas Strip Area

Two mining areas have been developed on this lease, one in 1941 and the second in 1942. Both areas were above the 13th level elevation or 198 feet above sea level. Mining was started in 1941 in the higher area on the 260' sub level elevation and this sub was nearly all mined by the end of the year. In 1942 mining was completed on the 260' and 250' sub levels, 90% completed on the 235' sub, and started on the 220' sub by two contracts. Four contracts worked all the year in this area. Water interferred with production when mining along the footwall side but working conditions on the balance of the sub level were very good.

The area mined on the 260' sub level was approximately 225 feet by 250 feet in size, on the 250' and 235' sub levels 200 feet by 250 feet, and the indicated area on the 220' sub will be 160 feet by 250 feet. The footwall pitches Southwestward at a flatter angle than the hanging wall which accounts for part of the reduction in the size of the area, also the limit of mining set for the second area being mined makes the hanging side of the area on the 220' sub a vertical wall and with the footwall advancing will cause a decrease in the area to be mined on each succeeding sub level in this upper block.

Three 13th level and one 14th level raise were in use in mining on the 235' sub level. On the 220' sub level where mining was started late in the year, two 14th level raises and three 13th level raises will be used. The advance of the footwall and the nearness of the 13th level haulage drift will make it necessary to use only the 14th level raises on the next lower or 210' sub level. Two of the four gangs working here will have to be moved to another area within a few months.

The second area was developed from 14th level raises beneath an area mined several years ago on the 235' sub level, Maas Mine. Two 14th level raises were in use when this sub was opened last Spring and two additional raises were completed and in use later in the year. Four contracts were mining here at the end of the year. The area here is 280 feet by 250 feet in size. The old covering on the 235' sub level is rotted but there has been less trouble from rock runs than was anticipated. A good covering is being laid on the floor of the 220' sub level to avoid trouble on the next lower sub level from rock runs after caving the old mat. Working conditions on this sub level are excellent as the ore is dry and fairly soft.

Almost exactly one-half of the Maas Strip area is now being mined. Two other areas, a small one on the 200' sub level, and the other on the 140' sub, remain to be developed and mined. The elevation of the 14th level is 75 feet so that in the larger part of the undeveloped portion of the Maas Strip the ore only extends 65 feet above the floor of the 14th level. This section is directly under the cave to surface and will be very wet and difficult to mine.

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7. UNDERGROUND: (CONT.)

c. Stoping: (Cont.)

(2) Detail of Stoping: (Cont.)

During 1942 sixteen raises were completed on the 14th level and two were being put up at the end of the year. Most of the raises were extended to the 220' sub level elevation 24 feet above the 13th level, and a few were extended to the 235' sub.

No. 2 cross-cut on the Maas Lease was extended 45 feet and No. 3 cross-cut 230 feet across the Maas Lease. The Southwest drift on the Negaunee Lease was extended 290 feet toward the West boundary of the Negaunee Lease from which it was only 90 feet distant at the end of the year.

At least nine more raises are required for development of the Maas Strip ore and eight for the Negaunee Lease Ore. However, a number of these raises will not extend to the 13th level elevation. These shorter raises are located near the Southwest end of the Negaunee Lease, also the Southwest one-fourth of the Maas Strip area.

d. Timbering:

There was less timber repair work in 1942 in main level haulage drifts but more repairs to raises. The haulage drifts on the 13th level that had been subjected to heavy pressure and crushing were largely abandoned by the end of 1942 due to completion of a number of 14th level raises and transfer of the ore to the 14th level. Timber repair work exclusive of the 13th level was about the same as in previous years for maintenance of airways and traveling roads.

The product increased 7% in 1942 and the amount of stull timber used in the mine, exclusive of cribbing timber, increased 6%. The average cost per foot for stull timber increased from .093 in 1941 to .0998 in 1942 or approximately 7.4%. Due to the large increase in cribbing timber used in 1942 the total average cost per foot for cribbing and stulls was slightly lower in 1942. The cost of seven foot lagging and nine and one-half foot poles used in 1942 was greater by $10,960.00 or 19%, than the cost of all the stull timber and cribbing used.

Forepoling over the caps and covering down the sub level floors required over 2,163,000 feet of nine and one-half foot poles, and lagging of the sides and back above the forepoles required 3,146,000 feet of seven foot lagging. The total cost per ton for cribbing, stull timber, lagging, poles and wire fencing was the highest in the past seven years. The actual increase in cost in 1942 as compared with 1941 was nearly 20% or.018 per ton. In explanation of this increase two factors must be considered, viz., the increase in cost per foot for cribbing, stull timber, lagging, and poles, also the increase of $5,227.00 in cost for cribbing used in 1942.

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7. UNDERGROUND: (CONT.)

d. Timbering: (Cont.)

Statement of Timber Used:

	Lineal Feet 1941	Lineal Feet 1942	Average Price, Foot 1941	Average Price, Foot 1942	Amount 1942	Amount 1941
6" to 8" Cribbing	102,066	221,253	.0355	.0400	8,853.28	3,626.16
8" Stulls	159,526	143,699	.0676	.0718	10,312.75	10,779.50
10" Stulls	204,245	217,752	.0977	.0967	21,058.16	19,952.83
12" Stulls	82,193	111,122	.1310	.1421	15,788.22	10,770.34
Total	548,030	693,826	.0825	.0807	56,012.41	45,128.83
Lagging - 7 ft.	2,871,945	3,146,026	.0080	.0094	29,699.82	22,866.22
Poles - 9½ ft.	2,183,989	2,163,043	.0130	.0172	37,275.28	28,395.83
Total	5,055,934	5,309,069	.0101	.0126	66,975.10	51,262.05
Wire Fencing, Ft.	6,600	9,570	.0623	.0628	601.31	411.44
Grand Total					123,588.82	96,802.32

	1942	1941
Product	1,106,694	1,033,220
Feet of Timber per ton of ore	.627	.530
Feet of Lagging per ton of ore	2.843	2.780
Feet of Lagging per foot of timber	4.534	5.240
Feet of Wire Fencing per ton of ore	.0086	.006
Cost per ton for Timber	.0506	.0437
Cost per ton for Lagging	.0269	.0221
Cost per ton for Poles	.0337	.0275
Cost per ton for Wire Fencing	.0005	.0004
Total Cost per Ton	.1117	.0937
Equivalent of stull timber to board measure	1,494,308	1,182,091
Feet of board measure for ton of ore	1,350	1,144

Total Cost for Timber, Lagging, Poles, etc.

Year	Product	Amount	Cost per Ton
1942	1,106,694	123,588.82	.1117
1941	1,033.220	96,802,32	.0937
1940	865,689	79,331.40	.0916
1939	551,362	57,608.66	.1045
1938	412,000	43,788.52	.1061
1937	820,915	76,759.61	.0935
1936	512,612	44,983.10	.0877

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7. UNDERGROUND: (CONT.)

e. Drifting and Raising:

The following table gives a comparison of total feet of drifting and raising in ore and rock in 1942 and 1941.

Year	Drifting		Raising		Grand Total
	Ore	Rock	Ore	Rock	
1942	1244'	1639'	2152'	1332'	6367'
1941	532'	3893'	1668'	814'	6907'
Increase	713'		484'	518'	
Decrease		2254'			540'

Drifting in rock decreased in 1942 while drifting in ore increased as also raising in both ore and rock. The decrease in rock drifting was due to development of the 14th level on the Negaunee and Maas Strip Leases having been largely completed in 1941. Drifting in ore increased due to driveing a cross-cut in ore on the Maas Strip Lease and other development drifting in ore. The large increase in raising in ore and rock was due to more development gangs putting up raises from the 14th level in 1942. There are still a number of raises to be put up from the 14th level but development of this level is now well advanced and there will be a large decrease in total drifting and raising in 1943.

f. Explosives, Drilling and Blasting:

The quality of the auger drill steel manufactured in the United States is much inferior to the Swedish steel available prior to the present war. As a result breakage of drills is much more frequent and loss from this cause has increased the consumption of auger steel. The ore being mined in the sub level stope is so hard that jackbits are used with 1¼ round hollow jackrods in drilling.

Supervision of blasting practices have been continued during 1942. Two checks were made by the shift bosses of every gang of miners and faulty practices corrected. This plan was inaugerated a few years ago and doubtless has prevented blasting accidents.

The following statement gives a comparison of Costs, etc., for the past ten years:

Year	Cost Per Lb. For Powder	Lbs. Powder Per Ton of Ore	Cost Per Ton for Powder	Cost Per Ton Fuse & Caps	Total Cost
1942	.1150	.4788	.0551	.0117	.0668
1941	.1150	.4792	.0551	.0118	.0669
1940	.1151	.4485	.0516	.0111	.0627
1939	.1176	.4584	.0539	.0113	.0652
1938	.1225	.4320	.0530	.0102	.0632
1937	.1195	.4270	.0510	.0110	.0620
1936	.1104	.4320	.0475	.0105	.0580
1935	.1168	.4270	.0498	.0102	.0600
1934	.1140	.4350	.0507	.0106	.0613
1933	.1196	.5110	.0610	.0130	.0740

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7. UNDERGROUND: (CONT.)

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

Statement of Explosives Used: (Ore Development and Stoping)

	Quanity	Average Price	Amount 1942	Amount 1941
Gelamite #1	505,525	11.50	58,146.88	56,611.62
60% Gelatin	24,400	11.50	2,817.50	327.75
Total Powder 1942	529,925	11.50	60,964.38	56,939.37
Fuse - feet	1,826,977	5.17	9,439.97	8,864.24
#6 Blasting Caps	249,998	12.18	3,044.74	2,916.52
Tamping Bags	39,000	4.33	168.84	107.52
Fuse Lighters	47,400	6.75	319.99	285.62
Master Fuse Lighters	500	.020	10.12	
Total Fuse, etc. 1942			12,983.66	12,173.90
Total Cost all Explosives			73,948.04	69,113.27
Product			1,106,694	1,033,220
Pounds Powder per ton of Ore			.4788	.4792
Cost per ton for Powder			.0551	.0551
Cost per ton for fuse, caps, etc.			.0117	.0118
Cost per ton for all explosives			.0668	.0669
(Sinking, Rock Development, etc.)				
Gelamite #1	5,600	11.50	644.00	414.00
60% Gelatin	25,150	11.50	2,892.50	1,472.35
Total Powder 1942	30,750	11.50	3,536.50	1,886.35
Fuse - feet	74,328	5.15	382.77	237.22
#6 Blasting Caps	11,182	12.19	136.30	78.43
Electric Detonators	368	11.67	42.95	
Total Fuse, etc. 1942			562.02	315.65
Total Cost all Explosives 1942 - Rock Dev.			4,098.52	2,202.00
Grand Total all Explosives Used 1942			78,046.56	71,315.27
Average Price per Pound for Powder 1942			.115	.115
Explosives used for stoping & Development			78,046.56	
Explosives used for Blasting Stockpile and Backfilling			133.33	
Total as per Cost Sheet			78,179.89	

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7. UNDERGROUND: (CONT.)

g. Mining and Loading:

Scraping distances were about the same as in 1941. That is, within limits of 80 feet to 125 feet. In special cases ore has been scraped distances as great as 150 feet to 200 feet. One new 20 H. P. high speed Scraper hoist was purchased in 1942 but as only a few high speed hoists are available only a limited number of contracrs mined ore at these unusually long distances from the raises.

There were no changes in the general mining system "Top Slicing", in 1942. An innovation for the Negaunee Mine was the adoption of the sub level stoping system for mining a small unusually hard ore body between the 14th and 13th levels. The jasper hanging above this ore is very hard and not a single fall from the hanging has occurred thus far in the stope and none are anticipated.

Timber bulkheads built around raises and in slices to safeguard the miners are now standard practice in the soft ore mines. They have prevented many accidents and also reduced expense for retimbering over the tops of raises. As has been stated in reports ever since the three-shift operation of the mines started, the greatest hazard to the miners occurs when the timber mat settles suddenly with comparatively little warning. The rapid rate of mining does not give time for the timber mat to settle and compact before the next sub level is mined. The timber bulkhead provides a safety zone even if the drift or slice crushes quite suddenly.

In advancing under new hanging and in the areas where there is heavy pressure, two four inch by ten foot H-beams are used along with three to five large nine and one-half foot poles for forepoling above the last timber set. If a fall of ground occurs adjacent to the breast of the drift or slice of sufficient weight to break the nine and one-half foot timber poles the steel H-beams will bend but do not break. They provide a space for protection of the miners.

h. Ventilation:

The new 120,000 cubic feet aerodyne fan went into operation on February 27th, 1942. The plant for heating the air also went into commission at this time and air reached the mine workings above freezingtemperatures. The larger capacity of the new fan insured an increased volume of air and the increase was immediately apparent in both the Negaunee and Maas Mines. Excellent ventilation was provided for the balance of the year. The bottleneck of a ventilation system in a mine is inadequate openings between levels. Restricted openings build up back pressure on the fan and reduce the volume of air. Close attention is given to the maintenance of existing openings to insure that they do not cave due to rotting of timber and if they can not be kept open new connections in solid rock are made between the levels. In the areas being mined there are many connections between the levels as every raise is available for the air to pass to the next lower level. Naturally the operating sub level has to be connected to the main airway on the level above by the drifts and raises back in the footwall. In dead-end areas booster fans force air to the sub levels. Doors on the main level drifts cause the air to travel up raises to the sub levels above and return through other raises back to the level from which point it travels through raises to the next lower level.

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YEAR 1942

7. UNDERGROUND: (CONT.)

h. Ventilation: (Cont.)

The severe cold Winter has not caused any trouble from ice in No. 2 shaft due to heating the air as it enters the fan. This is the first Winter that ice has not interfered with ventilation. Considerable stoker coal is required for heating the air. The consumption in sub-zero temperatures runs from five tons to eight tons every twenty-four hours. Periods with sub-zero weather so far have not persisted for more than two days, so that a car load or fifty tons of coal has lasted about two weeks.

i. Pumping:

In 1942 the number of gallons pumped per minute averaged below 700 gallons for the second consecutive year. There was a slight increase as compared with 1941, actually only 11 gallons per minute. This was due to more rainfall in 1942. In 1941 less than 600 gallons per minute was pumped in February, March and April, but in 1942, while these three months were the lowest of the year, the average per month was 47 gallons per minute higher than in 1941. The average gallons pumped in 1941, 645 gallons per minute, did not give a true picture as the Athens mine water was diverted to the Negaunee Mine on the 1,000' level connecting these mines for part of the months of May and June while a new discharge line was installed on surface at the Athens Mine. Assigning a normal amount for these two months brings the actual 1941 average for the Negaunee Mine to approximately 610 gallons per minute. Comparing this figure with 1942 shows an actual increase of 46 gallons per minute in 1942 instead of 11 gallons as shown in the above statement.

The deep well pump on Sec. 32, located a few hundred feet from the cave to surface North of No. 2 shaft operated throughout the year. The amount of water for the year was about 225 gallons per minute, the same as in 1941. The water pumped at the Negaunee Mine was decreased by this amount as this ground water formerly entered the mine through the caves to surface.

The 14th level pumping plant was installed in 1942 and the plant on the 13th level abandoned. The 13th and 14th level water and the water from the skip pit is now pumped to the 12th level and then by the 12th level pumps to the main pumping plant on the 10th level and hence to surface. Most of the mine water comes in on the 9th and 10th levels so that it is necessary to operate the 14th and 12th level pumps only a few hours each day.

Tables on following page.

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YEAR 1942

7. UNDERGROUND: (CONT.)

i. Pumping:

The number of gallons pumped per minute in each month of the year for the past six years are shown in the following statement:

Month	1942	1941	1940	1939	1938	1937
January	671	612	892	947	1038	893
February	636	591	857	938	906	866
March	635	584	768	944	951	1025*
April	627	582	700	963	988	1075
May	641	824**	747	995	1029	1062
June	659	838	678	1085	1052	1089
July	666	602	679	1177	1055	1107
August	662	613	685	1112	1085	1148
September	662	612	657	1067	1070	1161
October	667	605	644	1033	1044	1162
November	671	629	640	979	994	1131
December	675	646	618	947	973	1105
Total Average	656	645	714	1015	1015	1069

(*) Increase due to water diverted from Maas Mine and pumped by Negaunee Mine.

(**) Athens Mine water diverted to Negaunee Mine for months of May and June.

The following statement shows the average number of gallons pumped per minute for the past ten years:

YEAR	Gallons Per Minute
1942	656
1941	645
1940	714
1939	1015
1938	1015
1937	1069
1936	914
1935	918
1934	831
1933	857

NEGAUNEE MINE
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7. UNDERGROUND: (CONT.)

j. Underground in General:

The product in 1942 of 1,106,694 tons of ore was produced by an average of thirty-five contracts working seventeen shifts per week. A small amount of this ore came from development work but the percentage was small. The product represents the maximum possible with full operation of skip hoist which is the controlling factor. A reduction in the rock hoisted would have permitted a slight increase in ore production.

There was a large increase in the ore mined from the Maas Strip lease, from 6% of the product in 1941 to 22% in 1942. As working places on the Negaunee property had to be abandoned due to the footwall reducing the size of the mining areas, the contracts were transferred to the Maas Lease. Two years ago it was assumed that production would decrease from 15% to 20% in 1943 but it is now fairly well assured that the present high rate can be maintained for nearly all of the coming year. There is still a small reserve of ore on the Negaunee property as yet undeveloped for mining above the 14th level Southwest of the main ore body. No large tonnage is expected in this area but there will undoubtedly be sufficient ore developed here to provide working places for several contracts for a year or more. In addition to this reserve there is nearly one-half of the ore area on the Maas Strip as yet undeveloped for mining which will provide working places for a number of contracts as the mining areas decrease in size or are worked out on the Negaunee property.

The 9th level is holding out better than was expected when this level was reopened for mining No. 1 and No. 2 shaft pillars. Production here since reopening this level exceeds three-fourths of a million tons and ore is in sight for all the contracts working here during 1943 after which a decrease will occur.

8. COST OF OPERATING:

a. Comparative Mining Costs:

	1942	1941	Increase	Decrease
Product	1,106,694	1,033,220	73,474	
Underground Costs	1.184	1.125	.059	
Surface Costs	.098	.104		.006
General Mine Expenses	.189	.188	.001	
Cost of Production	1.471	1.417	.054	
Taxes	.110	.152		.042
Depletion & Depreciation	.262	.328		.066
Loading & Shipping	.035	.035		
Adm. & General Expense	.060	.074		.014
Miscellaneous Income	.007	.014		.007
Total Cost	1.931	1.992		.061
No. of Days Operated	308	303	5	
No. of Shifts & Hours	1, 2, & 3-8 Hr.	1,2 & 3-8Hr.		
Average Daily Product	3,593	3,410	183	

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8. COST OF OPERATING: (CONT.)

a. Comparative Mining Costs: (Cont.)

Cost of Production:

	1942	Percent	1941	Percent	Increase	Decrease
Labor	.956	65.0	.902	63.6	.054	
Supplies	.515	35.0	.515	36.4		
Total	1.471	100.0	1.417	100.00	.054	

b. Detailed Cost Comparison:

(1) Days and Shifts:

Year	Days Mine Worked	Shifts & Hours	Men Employed	Total Shifts
1942	308	1,2,& 3-8Hr.	487	136,567
1941	303	1,2& 3-8 Hr.	470	125,155
Increase	5		17	11,412

(2) Wages:

There was no increase in wages during 1942, the last increase being ten per hour effective April 1, 1941.

(3) Comparison of Production:

Production - 1942	1,106,694 tons
Production - 1941	1,033,220 tons
Increase	73,474 tons

(4) Comparison of Number of Men and Wages:

Year	No. of Men	No. of Days	Amount	Rate per Day
1942	487	136,567	1,046,988.98	7.67
1941	470	125,155	921,702.74	7.38
Increase	17	11,412	125,286.24	.29

(5) Tons Per Man Per Day:

	1942	1941	Increase	Decrease
Surface	49.83	51.26		1.43
Underground	9.68	9.84		.16
Total	8.10	8.26		.16

(6) Cost of Production:

1942	$ 1,628,336.42	Cost per Ton	$1.471
1941	1,464,078.37	Cost per Ton	1.417
Increase	164,258.05		.054

	Labor	Percent	Supplies	Percent
1942	1,057,944.00	65.00	570,392.42	35.00
1941	931,750.94	63.60	532,327.43	36.40
Increase	126,193.06	1.4	38,064.99	
Decrease				1.4

8. COST OF OPERATING: (CONT.)

b. Detailed Cost Comparison: (Cont.)

(7) Detail of Accounts:

	1942		1941		Incr. or Decr.	
Days per Week	6		6			
Shifts and Hours	1-8-3 2-8-50 3-8-255		1-8-27 2-8-24 3-8-252		1-8-24 2-8-26 3-8-3	
Production-Tons	1,106,694		1,033,220		73,474	
Number of Days Worked	308		303		5	
UNDERGROUND COSTS:	Amount	Per Ton	Amount	Per Ton	Amount	Per Ton
1. Exploring in Mine	4211.71	.004	5199.84	.005	988.13	.001
2. Sinking in Shaft						
3. Development in Rock	25333.67	.023	25029.73	.024	303.94	.001
4. Development in Ore	23716.02	.022	13484.41	.013	10231.61	.009
5. Stoping	526328.35	.475	486486.66	.471	39841.69	.004
6. Timbering	393582.25	.356	326192.66	.316	67389.59	.040
7. Tramming	142823.00	.129	125304.23	.121	17518.77	.008
8. Ventilation	12811.10	.012	10603.66	.010	2207.44	.002
9. Pumping	31812.47	.029	28889.04	.028	2923.43	.001
10. Compressors and Air Pipes	56416.56	.051	57716.02	.056	1299.46	.005
11. Back Filling	805.81	.001	1130.27	.001	324.46	
12. Underground Superintendence	33627.70	.030	29739.06	.029	3888.64	.001
13. Cave-in			1066.77	.001	1066.77	.001
14. Maint: Compressors and P.D.	2727.08	.002	2735.87	.003	8.79	.001
15. Scraper Equip.	24760.85	.022	23036.76	.022	1724.09	
16. Elec. Tram Equip.	26723.86	.024	24475.09	.024	2248.77	
17. Pumping Machinery	4552.28	.004	1175.35	.001	3376.93	.003
Total Underground Cost	1310232.71	1.184	1162265.42	1.125	147967.29	.059
SURFACE COSTS:						
18. Hoisting	48376.56	.044	43481.60	.042	4894.96	.002
19. Stocking Ore	9674.91	.009	11013.61	.011	1338.70	.002
20. Screening-Crushing at Mine						
21. Dry House	12554.20	.011	11398.99	.011	1155.21	
22. General Surface Expense	14424.69	.013	11140.08	.011	3284.61	.002
23. Maint: Hoisting Equip.	12966.27	.012	16290.96	.016	3324.69	.004
24. Shaft	6059.92	.005	4210.91	.004	1849.01	.001
25. Top Tram Equipment	2385.38	.002	4418.00	.004	2032.62	.002
26. Docks Trestles & Pkt.	1326.68	.001	842.38		484.30	.001
27. Mine Buildings	1211.55	.001	4849.59	.005	3638.04	.004
Total Surface Costs	108980,16	.098	107646.12	.104	1334.04	.006
GENERAL MINE EXPENSES						
Employees Vacation Pay	23887.01	.022	21577.90	.021	2309.11	.001
Sump & Pump E&A-NM-11	8911.30	.008			8911.30	.008
28. Insurance	6306.62	.006	6381.75	.007	75.13	.001
29. Mining Engineering	3161.85	.003	2743.26	.003	418.59	
30. Mech. & Elec. Engineering	2598.13	.002	2662.63	.003	64.50	.001
31. Analysis and Grading	24562.60	.022	20623.32	.020	3939.28	.002
32. Personal Injury	30142.22	.027	32298.96	.031	2156.74	.004
33. Safety Department	2304.41	.002	2024.53	.002	279.88	
34. Telephones and Safety Devices	4747.67	.004	3514.07	.003	1033.60	.001
35. Local & General Welfare	6733.02	.006	6716.96	.007	16.06	.001
36. Spc. Exp. Pension & Allowance	31733.05	.029	13642.38	.013	18090.67	.016
37. Social Security Taxes	24240.07	.022	39790.11	.038	15550.04	.016
38. Ishpeming Office	23314.27	.021	21992.67	.021	1321.60	
39. Mine Office	21995.16	.020	20896.59	.020	1098.57	
Weekly Wage Record			225.65		225.65	
Total Gen. Mine Expenses	214437.38	.194	195090.78	.189	19346.60	.005
COST OF PRODUCTION	1633650.25	1.476	1465002.32	1.418	168647.93	.058
Taxes	121784.67	.110	156738.64	.152	34953.97	.042
TOTAL COST	1755434.92	1.586	1621740.96	1.570	133693.96	.016
Budget-Tons and Cost	1,020,950	1.640	995,600	1.519	25,350	.121

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8. COST OF OPERATING: (CONT.)

b. Detailed Cost Comparison: (Cont.)

(7) Detail of Accounts: (Cont.)

UNDERGROUND COSTS:

1. Exploring in Mine:

DEcrease due to larger proportion of Cost of E. & A. NM-15 Exploration charged to this account in 1941.

3. Development in Rock:

Small increase due to more development work in rock. In 1942 there were 2784 feet of rock drifting and raising compared with 1872 feet in 1941, but to offset this decrease in 1941 a larger proportion of E. & A. NM-15 Exploration and cost of Emco Finlay loader E. & A. NM-12, amount $3,395.25 also charged in 1941.

4. Development in Ore:

Increase due to more development work in ore in 1942 account of raising from 14th level in the Negaunee and Maas Strip leases.

5. Stoping:

Expenditures increased $39,841.19. In 1942 there were 49,059 shifts worked compared with 46,734 shifts in 1941. Labor Cost increased $37,194.40 and supply cost increased $2,646.79. The cost per ton increased .004. Average tons stoping in 1942 were 22.17 tons compared with 21.88 tons in 1941. More shifts worked at week ends at time and one-half in 1942

6. Timbering:

Expenditures increased $67,389.59 Labor Cost increased $37,765.77 account of more shifts worked. The cost of Stull timber, Cribbing, Poles and Lagging increased $26,596.64. Two Utility Hoists at $475.00 each charged out also proportion of Cost of E. & A. CC-84, erecting Saw Mill $718.63. The cost for cribbing timber account of more raising in 1942 increased $5,227.12.

7. Tramming:

Expenditures increased $17,518.77. Electric current increased $286.60. Increase due to larger tonnage trammed and more shifts worked. Cost per ton increased .008.

8. Ventilation:

Expenditures increased $2,207.44. Labor and supplies repairing Aerodyne fan, 1 Coppers Fan, Drive Tex Ropes, Concreting floor in Boiler House building. Water tank and repairing coal pocket charged out in 1942. Cost per ton increased .002. Addition cost incurred in 1942.for coal in boiler plant for preheating the air.

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8. COST OF OPERATING: (CONT.)

b. Detailed Cost Comparison: (Cont.)

(7) Detail of Accounts: (Cont.)

9. Pumping:

Expenditures increased $2,923.43. Cost per ton increased .001. Electric current increased $2,455.66.

Number of gallons pumped, Year 1942	368,234,666
Number of gallons pumped, Year 1941	327,957,965
Increase	30,276,701

Average No. of gallons per minute for Year 1942	656
Average No. of gallons per minute for Year 1941	645
Increase	11

10. Compressors and Air Pipes:

Expenditures decreased $1,299.46. Cost per ton decreased .005. Electric current decreased $2,063.68. Less air used in development work in 1942.

Cubic feet of air compressed - 1942	1,432,260,000
Cubic feet of air compressed - 1941	1,503,165,000
Decrease	70,905,000

11. Back Filling:

Expenditures decreased $324.46. Less blasting of filling in working areas in 1942.

12. Underground Superintendence:

Expenditures increased $3,888.64, due to one additional Underground Foreman and one more shift Boss. Increase of four percent in salaries of Foreman and Shift bosses effective September 15th, 1941.

13. Cave-in:

Expenditures decreased $1,066.77, due to charging cost of new water line from city mains account of caving ground in 1941.

14. Compressors and Power Drills:

Expenditures decreased $8.79. One R 48 Stoper #365.00 and four R. B. 12 Jackhammers $800.00 charged out in 1942 compared with 4 R. B. 12 Jackhammers $800.83 and four second hand N 72 Drifters $400.00 charged out in 1941. Also intake and discharge valves for Ingersoll-Rand compressor $455.71 charged out in 1942.

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8. COST OF OPERATING: (CONT.)

b. Detailed Cost Comparison: (Cont.)

(7) Detail of Accounts: (Cont.)

15. Scrapers and Mechanical Loaders:

Expenditures increased $1,724.09. One 20 H. P. Ingersoll-Rand scraper hoist $1,469.00 charged out in 1942. Repairs to scrapers and scraper hoists increased slighty in 1942. Cost per ton .022, same as in 1941.

16. Electric Tram Equipment:

Expenditures increased $2,248.77. Cost per ton .024, same as for 1941.

	1942	1941	Increase	Decrease
Locomotives	6,946.99	12,182.43		5,235.44
Wiring	3,153.62	2,306.90	846.72	
Tracks	11,100.79	6,028.23	5,072.56	
Cars	4,635.05	3,841.71	793.34	
Generators	217.01	115.82	101.19	
Prop. Invest. Gen Shops	670.40		670.40	
Total	26,723.86	24,475.09	2,248.77	

17. Pumping Machinery:

Expenditures increased $3,376.93. Cost per ton increased .003. Increase due to completing excavation of the 14th level pump house and sump, installation of pump on 14th level, also repairs to Cameron and Prescott pumps. The expense on 14th level pump house is exclusive of E. & A. NM-11 which was closed before the work was completed.

SURFACE COSTS:

18, Hoisting:

Expenditures increased $4,894.96. Cost per ton increased .002. Cost of electric current increased $2,145.56, labor increased $2,426.67 account of more shifts worked and overtime pay. Current increase due to hoisting more ore from the 14th level.

19. Stocking Ore:

Expenditures decreased $1,338.70. Cost per ton decreased .002. Decrease due to less ore put on stockpile account of early opening and late closing of navigation on lakes permitting more shipments from pocket.

21. Dry House Expense:

Expenditures increased $1,155.21. Cost per ton .011, same as in 1941. Increase due to more fuel and water used, also due to purchase of one Maytag washer $134.95 and one Gould booster pump to maintain constant pressure in showers $280.00.

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8. COST OF OPERATING: (CONT.)

b. Detailed Cost Comparison: (Cont.)

(7) Detail of Accounts: (Cont.)

22. General Surface Expense:

Expenditures increased $3,284.61. Cost per ton increased .002. Increase due to erection offence at East end of property, and installation of 500 Watt floodlights at stratigic points on surface. All this work done in connection with the war effort as added protection against sabotage.

23. Hoisting Equipment:

Expenditures decreased $3.324.69. Cost per ton decreased .004. Decrease due to E. & A. NM-13, New Skip drum $5,499.87 and E. & A. NM-4, Double Deck Aluminum Cage $2,322.85 charged to this account in 1941. Three hoisting ropes charged in 1942 compared with four in 1941.

24. Shaft:

Expenditures increased $1,849.01. Cost per ton increased .001. Increase due to more repairs to shaft account of heavier operating schedule necessitating payment of more overtime shifts at weekends.

25. Top Tram Equipment:

Expenditures decreased $2,032.62. Cost per ton Decreased .002. Decrease due to one 75 H. P. Motor $979.44 and cost of installation $180.00 charged in 1941, also less spools, rollers, sheaves and wire rope used during 1942 account of longer shipping season.

26. Docks, Trestles and Pockets:

Expenditures increased $484.30. Cost per ton increased .001. Increase due to more repairs to shaft house pockets and chutes, also new ties and decking installed on main steel stocking trestles.

27. Mine Buildings:

Expenditures decreased $3,638.04. Cost per ton decreased .004.

	1942	1941	Increase	Decrease
Office	140.87	10.66	130.21	
Warehouse	.23		.23	
Shops	12.89	16.69		3.80
Garage		304.04		304.04
Shaft House	150.57	69.52	81.05	
Engine House	241.57	839.25		597.68
Dry House	244.65	3,423.24		3,178.59
Coal Dock and Trestle	115.91	59.57	56.34	
Miscellaneous	104.71	109.74		5.03
Fire Protection	112.06	15.00	97.06	
Timber Tunnel	2.58	1.88	.70	
Mine Rescue Room	50.28		50.28	
No. 2 Shaft House	35.23		35.23	
Total	1,211.55	4,849.59		3,638.04

The largest decrease was in "Dry House" account of charging part of the cost of remodeling direct to operating cost in 1941.

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8. COST OF OPERATING: (CONT.)

B. Detailed Cost Comparison: (Cont.)

(7) Detail of Accounts: (Cont.)

GENERAL MINE EXPENSES:

Employees Vacation Pay:

Expenditures increased $2,309.11. Cost per ton increased .001. In 1942 - 332 employees were eligible for vacation with pay compared to 343 in 1941: 172 employees with a record of 10 years or more of continuous service were eligible for two weeks vacation pay and 152 employees with a record of 3 years or more of continuous service were eligible for one week vacation pay. Also eight employees inducted into armed forces received vacation pay checks. All employees worked during vacation period receiving their Vacation checks with their regular pay checks. The increase was due to more employees qualifying for two weeks vacation pay in 1942.

Sump and Pump - E. & A. NM-11

Total expenditure E. &. A. NM-11, 14th level pump house and sump, $8,911.30 charged by Cleveland office in December. E.&A. closed in May. There were no charges to this E. & A. during 1941. The cost sheet lists E. & A. NM-11 under General Mine Expense.

28. Insurance:

Expenditures decreased $75.13. Cost per ton decreased .001.

	1942	1941	Increase	Decrease
Property	3,371.41	3,164.37	207.04	
Group	2,198.55	2,558.30		359.75
Catastrophe	736.66	659.08	77.58	
Total	6,306.62	6,381.75		75.13

29. Mining Engineering:

Expenditures increased $418.59. Cost per ton same as in 1941.

30. Mechanical and Electrical Engineering:

Expenditures decreased $64.50. Cost per ton decreased .001.

31. Analysis and Grading:

Expenditures increased $3,939.28. Cost per ton increased .002.

	1942	1941	Increase	Decrease
Ishpeming Laboratory charge	18,345.56	14,450.56	3,895.00	
Shipping Dept. Expense	3,812.35	3,546.78	265.57	
Mine Sampling	2,404.69	2,625.98		221.29
Total	24,562.60	20,623.32	3,939.28	

There were 47,745 determinations in 1942 compared with 44,839 in 1941. Increase due to larger production and more shipments. Cost per determination higher in 1942.

NEGAUNEE MINE
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8. COST OF OPERATING: (CONT.)

b. Detailed Cost Comparison:(Cont.)

(7) Detail of Accounts: (Comt.)

32. Personal Injury:

Expenditures decreased $2,156.74. Cost per ton decreased .004.

	1942	1941	Decrease
Compensation and Doctors	23,819.91	25,107.73	1,287.82
Compensation Dept.	849.74	882.69	32.95
Hospital Loss	5,472.57	6,308.54	835.97
Total	30,142.22	32,298.96	2,156.74

33. Safety Department:

Expenditures increased $279.88. Cost per ton same as 1941.

34. Telephones and Safety Devices:

Expenditures increased $1,033.60. Cost per ton increased .001. Increase due to more expense for repairs to mine rescue room, also purchase of new fire extinguishers for surface and underground.

35. Local and General Welfare:

Expenditures increased $16.06. Cost per ton decreased .001

	1942	1941	Increase
General Welfare	5,576.66	5,565.75	10.91
District Welfare	1,156.36	1,151.21	5.15
	6,733.02	6,716.96	16.06

36. Special Expense, Pensions, and Allowances:

Expenditures increased $18,090.67. Cost per ton increased .016.

	1942	1941	Increase	Decrease
Pensions	2,499.96	2,807.38		307.42
Legal	506.92	853.75		346.83
Saranac Invest.	2,681.14	2,906.74		225.60
Central Empl. Off.	1,154.83	1,409.34		254.51
Retirement Exp.	3,802.70	4,219.44		416.74
Other	21,087.50	1,445.73	19,641.77	
Total	31,733.05	13,642.38	18,090.67	

37. Ishpeming Office:

Charge to Negaunee Mine increased $1,321.60. Cost per ton same as 1941. Expense is based on total labor cost at mine.

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8. COST OF OPERATING: (CONT.)

b. Detailed Cost Comparison: (Cont.)

(7) Detail of Accounts: (Cont.)

38. Social Security Taxes:

Expenditures decreased $15,550.04. Cost per ton decreased .016.

	1942	1941	Increase	Decrease
Unemp. Insurance Tax	13,739.28	30,536.57		16,797.29
Old Age Benfit Tax	10,500.79	9,253.54	1,247.25	
Total	24,240.07	29,790.11		15,550.04

39. Mine Office:

Expenditures increased $1,098.57. Cost per ton same as 1941.

	1942	1941	Increase	Decrease
Mine Office Expense	10,303.73	10,046.64	257.09	
Supt. & Asst. Supt.	6,363.53	6,563.66		200.13
Central Warehouse	5,327.90	4,286.29	1,041.61	
Total	21,995.16	20,896.59	1,098.57	

Increase due to more Warehouse Overhead Expense charged in December, this charge being interest on investment. No new office equipment was purchased during 1942 whereas in 1941 purchases of equipment included one office file $118.50, one Remington Adding machine $119.42 and one Monroe electric calculator $320.80.

39½. Weekly Wage Record:

There were no charges to this account during 1942. In 1941 an expenditure of $225.65 charged out. In 1942 the weekly wage record expense was charged to "Special Expense" account Number 36.

40. Taxes:

Expenditures decreased $34,953.97. Cost per ton decreased .042.

9. EXPLORATIONS AND FUTURE EXPLORATIONS:

During 1941, in accordance with an agreement made with the Negaunee Mine fee owners, exploration of high sulphur ore body, encountered in No. 3 shaft when sinking from the 12th to 13th level and also in old surface drill hole No. 17, was started and during 1941 three holes were drilled from surface in an effort to intersect this small ore trough. No ore was found in any of these holes. In December 1941 it was decided to drill one more hole near old No. 17 drill hole on an angle to intersect the ore found in No. 17 hole. If no ore was found or merely a thin seam it was conclusive evidence that this ore trough did not have enough ore to warrant development from the Negaunee Mine. In 1940 this ore was developed by a raise and cross-cut between the 13th and 12th levels and found to be very high in sulphur and small in size. Due to these two unfavorable factors development for mining near the 12th level was not warranted. The surface drilling was planned to prove if the ore widened to the East, became thicker and the sulphur

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9. EXPLORATIONS AND FUTURE EXPLORATIONS: (CONT.)

content decreased. No ore was found in No. 29 hole and the fee owners now concede that no further proof in the area above the 13th level is necessary and this area can therefore be eliminated from further consideration. Some exploration below the 13th level is planned to ascertain if the ore trough is wider and also to prove if the sulphur content diminishes. This work will be postponed however, until after the war.

Following is the log of Hole No. 29, drilled in 1942:

Hole No. 29 - Negaunee Mine - Section 5, 47-26 - Started December 27th, 1941, finished April 28th, 1942. Standpiped 85 feet, drilled 689 feet with carbon. Dip 83°.

FOOTAGE	MATERIAL
0' - 85'	Sand, boulders, gravel, and hard pan
85' - 110'	Soft ore jasper
110' - 120'	Dike
120' - 128'	Soft ore jasper
128' - 196'	Hard blue jasper
196' - 215'	Soft ore jasper
215' - 226'	Hard blue jasper
226' - 265'	Soft ore jasper
265' - 270'	Lean ore - Iron 45.30 Phos. .033
270' - 306'	Soft ore Jasper
306' - 349'	Hard blue jasper
349' - 403'	Soft ore jasper
403' - 406'	Dike
406' - 412'	Soft ore jasper
412' -524'	Dike
524' - 625'	Soft ore jasper
625' - 630'	Lean ore - Iron 46.49 Phos .055
630' - 638'	Soft ore jasper
638' - 640'	Slate
640' - 643'	Mixed slate and jasper
643' - 654'	Soft ore jasper
654' - 659'	Transition slate and slate
659' - 675'	Slate
675' - 682'	Soft ore jasper
682' - 691'	Slate
691' - 694'	Soft ore jasper
694' - 774'	Slate

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9. EXPLORATIONS AND FUTURE EXPLORATIONS: (CONT.)

Following is a detailed cost of Hole No. 29.

Drilling Cost	Expended 1942	Unexpended Balance
Unexpended balance end of 1941		$7,619.62
Labor	$ 1,948.77	
Supplies	794.27	
Diamond Drill Carbon	579.29	
Diamond Drill Rental	248.00	
Total Labor, etc.	3,570.33	
Overhead Expense		
Analysis	238.06	
Geological	116.39	
Diamond Drill Supt.	154.76	
Social Security Exp.	37.63	
Total Overhead Expense	546.84	
Grand Total Expended 1942	4,117.17	
Unexpended Balance end of 1942		3,502.45

All expenses in 1941 charged to operating the mine, one-half to "Exploring in Mine", and one-half to "Rock Development". In 1942, the expense was charged in the same manner.

10. TAXES:

A comparison of taxes paid by The Negaunee Mine Company in 1942 and 1941 follows:

	1942		1941	
	Valuation	Taxes	Valuation	Taxes
Realty - 218.07 acres	1,350,000	44,114.22	2,070,000	68,742.22
Pers. Stockpile, Equip, Supplies	680,000	22,220.50	805,000	26,733.09
Total by Tax Commission	2,030,000	66,334.72	2,875,000	95,475.31
Collection fees		663.35		954.75
Total Optg. Neg. Mine	2,030,000	66,998.07	2,875,000	96,430.06
Adams Strip (All 1942 - $\frac{3}{4}$ 1941)	75,000	2,475.30	45,000	1,509.35
Maas Lease Area	1,585,000	52,311.30	747,908	25,086.40
Grand Total Optg. Neg. Mine	3,690,000	121,784.67	3,667,908	123,025.81
MATHER MINE				
Realty - Sec. 1, 47-27	470,000	15,511.86	470,000	15,764.22
Realty - Sec. 2, 47-27	1,125,000	38,974.84	480,000	16,953.50
Personal Property	175,000	6,062.75	20,000	706.40
Collection fees		450.38		176.60
Total Mather Mine	1,770,000	60,999.83	970,000	33,600.72
Cloverdale Tract	600	20.98	322	11.48
Grand Total Mather Mine	1,770,600	61,020.81	970,322	33,612.20
Total Optg. Neg. & Mather Mines	5,460,600	182,805.48	4,638,230	156,638.01
Negaunee Rented Buildings	1,200	39.21	6,200	205.91
Collection fees		.39		2.06
Grand Total Neg. Mine Co.	5,461,800	182,845.08	4,644,430	156,845.98

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10. TAXES: (CONT.)

	1942		1941	
	Valuation	Taxes	Valuation	Taxes
Tax Rate Per $100 of Valuation				
City of Negaunee		3.267		3.321
City of Ishpeming		3.464		3.532
Negaunee Mine Co. Percent of Taxes				
City of Negaunee		25.33		25.46
City of Ishpeming		11.42		8.88
Division of Payaments				
City of Negaunee	4,161,200	137,336.13	4,144,108	138,998.00
City of Ishpeming	1,300,600	45,508.95	500,322	17,847.98
Total	5,461,800	182,845.08	4,644,430	156,845.98
Distribution by Accounts				
Operating Negaunee Mine Only	3,690,000	121,784,67	3,667,908	123,025.81
Mather Mine & New Acquistions	1,770,600	61,020.81	970,322	33,612.20
Grand Total Optg. Neg. Mine	5,460,600	182,805.48	4,638,230	156,638.01
Optg. Neg. Rented Bldgs.	1,200	39.60	6,200	100.63
Accts Rec. CCICo. Land Dept.				107.34
Grand Total Neg. Mine Co.	5,461,800	182,845.08	4,644,430	156,845.98

Taxes paid operating the Negaunee Mine, exclusive of the Adams Strip and the Maas Lease decreased $29,431.99 in 1942 or approximately 30.5 percent. To offset this decrease the taxes on the Adams Strip and the Maas Lease were increased $28,190.85 resulting in a net decrease of only $1,241.14. There was a small decrease in the tax rate per $100 of Valuation in both the City of Negaunee and the City of Ishpeming. The total taxes paid by the Negaunee Mine Company which includes the Mather Mine in addition to the Negaunee Mine, is shown in the above tabulation as was also done in 1941.

11. ACCIDENTS AND PERSONAL INJURY:

The accident record in 1942 was not as good as in 1941 as more accidents occurred and the severity rate was higher. There was one fatality in 1942 and one in 1941.

Supervision and discipline has not relaxed but more men have been hired and the mine operated more shifts than in 1941. The heavy operating schedule with employees working at high pressure has been the main factor in increasing the number of accidents. It should be noted that about 50 percent of the men that were injured had been employed for a number of years, the balance were more recently employed. Approximately 60 percent of the total accidents were slight and caused a loss of time of less than one month. Seven of these accidents, of 44 percent of the slight accidents, caused a loss of time of less than one week, There were five severe accidents that caused a loss of time of over four months, and five that the lost time was from one to four months. Of the twenty-seven accidents, 40 percent were more or less severe and 60 percent slight.

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11. ACCIDENTS AND PERSONAL INJURY:

Following is a statement listing the accidents that occurred during the year:

	1942	1941	1940	1939	1938
Fatal	1	1	2	0	0
Time Lost - Over four months	5	3	4	3	4
- One to four months	5	4	8	2	6
- Less than one month	16	8	9	4	0
Total Compensable Accidents	27	16	23	9	10
Number of cases paid compensation for accidents prior to 1-1-1942	6	4	2	10	11
Number of cases being paid diff. in wages (Incl. in above total)	1	0	0	3	4

Fatal Accident:

On July 5th, 1942, Leslie Wertanen, a miner, received and injury that caused his death two days later.

Wertanen, a miner, was working with the shaft repair crew on Sunday, July 5th, removing the old 10th level measuring pocket which it was planned to rebuild as mining was to be resumed on the 10th level within six months. Mining was abandoned on the 10th level in November 1929 and the pocket had only been used a few times in the past thirteen years for handling rock from ventilation raises. On Saturday, July 4th, the crew started tearing out the South measuring pocket. This work was done from a platform on the South skip which was spotted in the shaft in front of the measuring pocket. Due to rust it was impossible to remove the old bolts and the acetylene torch was used to cut the old plates into pieces that could be hoisted to surface on two cables under the skip. The plate that formed the front of the pocket was cut out, as also the door in the bottom and one side plate and all hoisted to surface on Saturday. Work was continued Sunday morning and a section from the other side was cut out and hung under the skip preparatory to hoisting it to surface. At this time David Pynnonen, the Timber Foreman in charge of the work was standing in the small opening under the North measuring pocket (that had not been cut up) while Wertanen and his partner, Herman Saastamoinen, were in the larger opening under the partially removed South measuring pocket. Directly above Wertanen was the remaining part of the measuring pocket in its original position. It consisted of part of the bottom and side plates approximately 36" by 60" in size. Its weight was estimated to be about 700 pounds. Wertanen and Saastamionen were on the point of leaving when, without warning, the remaining section of the pocket broke away and fell. It fell about four or five feet on some plank that was used for staging and tipped over on Wertanen who was knocked over against the rock wall at the back of the excavated space under the pocket and his head was squeezed between the rock and the falling section of the pocket. There were seven bolts holding the side plates of this section of the pocket to two sound 8" by 8" horizontal timbers and also two bolts holding the bottom plate to a sound 12" by 12" cross timber. Examination showed that all of the bolts were rusted away to a small fraction of their original diameter so that the weight of the

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11. ACCIDENTS AND PERSONAL INJURY: (CONT.)

section was sufficient to shear off the rusted bolts. The heads of the bolts had been cleaned preparatory to burning them off and there was no indication of rusting or weakness. The bolts sheared off between the timber and the plate so there was no opportunity for inspection. The pocket is wet from water coming in the shaft below ledge which caused the bolts to rust and at the same time preserved the timbers to which the pocket was bolted.

The accident was due to the foreman not taking steps to prevent the upper section of the old pocket from falling. It could readily have been chained in place or supported by props but it did not occur to the foreman or any of his crew that there was any danger of it falling. The ninth level pocket was cut up and removed in the same manner when it was rebuilt in 1936. At that time it was necessary to pull on this section with the skip after the heads of the bolts were burned off to release it. On the ninth level the bolts showed no evidence of weakness from rusting and thus there was no reason for the foreman or the crew to be on their guard to prevent the tenth level section from falling.

Wertanen was thirty years of age, married, with one child five years old. He was quiet and industrious and for nearly a year had been engaged in putting up raises, prior to which time he had mined and driven rock drifts. His untimely death is a distinct loss to the Company as he had more than average intelligence and ability. He had been employed eight years, starting as a miner with his father, an old and trusted employee.

This accident is another one that was unusual and impossible to foresee. The bolts rusted away at a hidden point (between the plates and the timber). A similar accident will never occur for the lesson is plain that even nine bolts can not be trusted to hold after an idle period of ten years or more.

12. NEW CONSTRUCTION AND PROPOSED NEW CONSTRUCTION:

E. & A. NM-8 - Ventilation Equipment - Maas and Negaunee Mines

	Amount Authorized	Expended 1941 & 1942	Unexpended Balance
Aerodyne 8-H Fan	$ 3000.00	$ 3351.41	$ 351.41
Steel Adapter	1281.00	1281.00	
Air Lock Door	150.00	150.00	
Shut-off Door	140.00	308.03	168.03
Excavation and Foundation	550.00	996.94	446.94
125 H.P. Motor	2000.00	1773.98	266.02
Tex Rope Drive	300.00	408.00	108.00
House for Motor & Equipment	800.00	1093.63	293.63
Installation and Freight	1000.00	925.57	74.43
Social Security Taxes		56.23	56.23
	9221.00	10304.79	1083.79
10 Percent for Contingencies	900.00		900.00
Grand Total	10121.00	10304.79	183.79