

ATHENS MINE - 1919.

The production for the year was as follows:-

Athens Ore,	140,793 tons,
Rock,	14,868 "

The ore from the various leases was as follows:-

Athens,	122,316 tons,
Corbit Lease,	9,621 "
Mitchell Lease,	8,856 "

This product came from the development in the East end of the mine on the fourth level and from the sub levels above and in the West end of the mine in regular mining operations and developments from the eighth level.

UNDERGROUND.

Above the eighth level regular mining operations started shortly after the beginning of the year in sub levels near the North dike, but as the season progressed, it was found that ore to the Southeast extended to a great height above the level so that no sub level work could start in that territory until the actual hanging was outlined. Through successive stages of development, the top of the ore was finally found here at the elevation of the fourth level. The development was necessarily slow as extremely high raises and sub raising had to be employed. Within a few months this territory will be reached by one of the main drifts on the fourth level, which will greatly improve the ventilation, expedite the handling of timber, and shorten the travelling road for the men to and from their work. A great deal of the product for the year came from the development work which made the cost per ton considerably higher than if obtained by stoping.

The development above the fourth level has been almost wholly in the East end of the mine on the Corbit Lease, Lot #13. Here we have endeavored to find the top of the ore and the high sulphur areas. The first high sulphur found was in the latter part of the year near the South foot and in the close proximity to the Lucky Star boundary on the -170' sub level.

As the high sulphur extends below this elevation further development is necessary to find the bottom limit. The sulphur area to date shows an average analysis of 1.43 and will be taken up under a separate heading.

On the fourth level proper, the development to the West has been along the North and South foot walls. In the former, after the hanging jasper had been cut, a drift was started to the Southwest to hole to the workings at this elevation from the eighth level.

DEVELOPMENT ON THE VARIOUS BEVELS AND SUB LEVELS THROUGHOUT THE YEAR.

-95' SUB LEVEL.

This sub level in the Corbit Lease was started in October at the top of #410 raise. This elevation was supposed to be approximately the bottom limit of the high sulphur area as shown by diamond drill holes or at an elevation of approximately 1500' from surface. The formation in #410 raise showed that it was near the jasper hanging, however, most of the distance from the 260' sub level (where an extension to #410 raise was started this year) was raised in ore. A drift was driven East in jasper for 33', then turned North towards the foot wall. The jasper was crossed 122' before mixed ore formation was encountered. In December 58' was advanced, the last 8' in mixed ore averaging somewhat over 50% in iron. In the jasper just before the ore was cut were two small dikes crossing the formation in a Northeast-Southwest direction. The dikes were standing nearly vertical. Development will continue here to the North until the foot wall is reached.

170' SUB LEVEL.

This sub level was opened in July at #411-1 raise put up from the 260' sub level. The top of the raise was in jasper, therefore, the sub level was started at some 20' below but in ore. After drifting a few feet to the South, jasper was cut, which continued for 112' when ore was again encountered. After drifting 67' in first class ore, a high sulphur area was found. The drift continued 20' in this material which averaged 1.43 sulphur when development in this direction stopped. A horizontal drill hole 15' in length from the

breast showed an average of 1.41 sulphur, with merchantable ore. Work in this direction was abandoned, and drifts were started to the East and West back of the high sulphur area to test for sulphur limits. The drift to the East after advancing 20' met jasper. A small test raise put up to the Southeast from its breast encountered ore 11' above the rail. This raise has continued to a height of 36' in ore averaging between 52 and 59% iron, with sulphur at the breast of about .105. This will be continued until the high sulphur limit is determined.

The drift to the West was advanced 36', the first 30' of which was in ore of good quality, the last 16' in lean ore. No high sulphur was encountered.

During December work was carried on in the East raise and in the West drift.

230' SUB LEVEL.

Raise #412 from the fourth level was abandoned early in the year, when a quantity of water was encountered. Nothing was done here until April when the South drift on the 260' sub level holed to it. The top of the raise caved when this drift holed, on account of the cribbing giving way. It was decided to cut out at an elevation of -230 but later in order to make the place safe for the workmen, an auxilliary raise was put up from the 260' sub level at a point 45' to the North. The drifts from these two raises holed, after which the top of #412 raise was properly blocked. It showed that the new sub level was nearly at the top of the ore, jasper barriers crossing between the two raises and a test raise was put up to the Northwest. The material encountered was jasper from 0 to 65', ore from 65' to 110', jasper from 110' to 125', when the raise was stopped.

260' SUB LEVEL.

The work here was wholly exploratory from #410 and #412 raises. The jasper hanging was partially outlined and the North and South foot wall positions determined. Practically all of the ore found was of excellent quality with no evidence of high sulphur. The developments of this sub level were principally on the Corbit Lease Lot #13.

FOURTH LEVEL.

The work for the year on the fourth level was all to the West of the main Southeast crosscut. North and South foot wall drifts were planned to outline the limits of the ore to the West.

North Drift.

After driving 330' due West dike was encountered. A drift to the South was started 50' back from the West breast and cut jasper at 40' and continued in this material 45' farther. Work here was abandoned for several months. Test raises from the 515' sub, above the eighth level in the West end of the mine, found ore just below the fourth level elevation on the North side of a large dike which extended through the formation in a Northeast-Southwest direction. As this dike lined up with that which cut off the drift to the West along the North foot of the fourth level it was decided to extend this drift through the dike. Work was started here in November. After drifting 79' through dike, ore was struck and crossed for 91' when jasper was met. A turn has been made parallel to the dike and on its Northwest side, and will extend to the workings developed from the raises above the 515' sub.

South Foot Wall Drift.

From information obtained from the main Southeast crosscut on this level and developments on the 660' sub level above the eighth level, the South foot wall drift to the West was planned to parallel the South foot at a distance of about 30' in the ore. Work here was started in July. After drifting 310' a bar of jasper 30' wide was encountered; 40' of ore was then cut after which the drift was advanced 90' in jasper where work was stopped. Horizontal diamond drill holes #9 and #10 tested the formation to the Southwest and Northwest and proved the material to be the hanging. In the former a short run of ore was found which was probably a small rich seam. In November a drift to the South was started in the ore between the true hanging and the jasper bar. The breast at present is 200' South of the main foot wall drift and has encountered lean material. The entire crosscut has been in ore of excellent quality with occasional bunches of jasper appearing on the West side of the drift. This development has found the true South foot to be much farther to

the South than supposed. There may be a fold in the formation which later developments will prove.

In the Southwest end of the mine a rock drift has been driven on the fourth level elevation at the top of #852-2 raise put up from the 515' sub level. This raise had ore to within 20' of the fourth level when jasper was cut. It was expected that ore would be found against the large dike which was known to exist at a point about 60' to the South. An exploratory drift in that direction found the large dike split into two smaller dikes and no ore at this elevation.

DEVELOPMENTS FROM THE EIGHTH LEVEL IN THE SOUTHWEST END OF MINE.
515' SUB LEVEL.

The development early in the year to the East from #821-1 raise from the 660' sub level proved that ore existed on the Southeast side of the main eighth level shaft crosscut at a much higher elevation than on the Northwest side of this crosscut. Raise #854 had been put up to an elevation of 18' above the -660' sub level. This raise was connected to the Northwest workings on the 660' sub by means of a crosscut. It was then decided to explore for the top of the ore above this sub level. Raises #852 and #853 were started from the eighth level, holed to the -660' sub and continued up to the -540' and -515' where sub levels were cut out just below the hanging. The development on the 515 was started in July from #853 raise to the Southwest and Northeast. The Southwest development was not extensive. After drifting 26' in ore, dike and mixed material were found; a small drift was extended to the South 40' in lean jasper. Diamond drill hole #8 was drilled horizontally from this breast to the Southwest and entered slate foot wall at 15'. This hole was drilled to a depth of 300' or within 40' of the Breitung Hematite Mining Company's boundary.

The principal development on this sub level is to the Northeast of #853 raise. At 50' from the raise an exploratory crosscut was turned off to the right while the regular development proceeded to the Northeast. The crosscut to the right or to the Southeast encountered dike at 5' which proved to

have a thickness of 30' beyond which jasper was found. The strike of the formation on the West side of this dike was to the Northeast-Southwest, while on its Southeast side it was to the Northwest-Southeast, or almost parallel with this jasper exploratory drift. Nos. 811-1 and 811-2 raises have been put up, the first finding the top of the ore at 107' from the rail of the sub. This was extended to the Fourth level in rock and has been mentioned in the report on that level. Raise #811-1 put up to the Northwest in ore, struck jasper hanging at 60' from the rail and was abandoned temporarily, while raise #811-2, almost opposite, at the end of the year was 79' above the rail, the back still in ore. This raise will be extended through to the fourth level.

540' SUB LEVEL.

This sub level was started in June under the jasper at #852 raise. A drift on the foot side connected to #853 raise, while from the Northeast side, the jasper was followed for 53'. From this point a crosscut to the Southeast was driven 75' in ore and 25' in dike and stopped in jasper. At a point 90' back from the breast a drift was driven 50' to the Northeast in ore. A raise from this drift was extended to the 515' sub level to provide an additional travelling road. Development on this sub level was simply duplicating the work on the 515 so was stopped.

SIXTH LEVEL.

In order to provide a sufficient number of working places to give the desired product, it was necessary to open the sixth level. To do this as quickly as possible work was started in November by cutting out at #852 raise. To date a connection has been made with the #853 to facilitate handling of timber. One of the main level drifts is now being pushed to the Northeast. This has advanced 100' from #852 raise in ore.

At the shaft it is not the intention at present to cut a pocket. Two raises starting from the eighth level shaft pocket have reached the height of the seventh level. This will be continued through to the sixth and will hole at that elevation about 18' West of the shaft. The main shaft crosscut will be driven South from the top of this raise and a connection will be made with the

cage compartment.

620' SUB LEVEL.

Work here was started at #851-1 raise in March. A drift was driven South 92' to the East in ore. It was seen that ore in this territory reached a greater height than that to the Northwest and this development resulted in extending raises #852 and #853 through to the hanging jasper with further developments on the sub levels mentioned above from these raises. Raise #852 holed to this sub level in May.

635' SUB LEVEL.

This was developed under the hanging jasper at raises #821-1, #822-1 and #823-1 in February. A small area was mined. This sub marked the Northeast mining limit of the ore on the Northwest side of the main eighth level crosscut to be mined through the eighth level.

645' SUB LEVEL.

This was opened on the Northwest side of the main eighth level crosscut in March at raises #822, #821-1 and #823-1. The area was small and the sub level was finished in May.

660' SUB LEVEL.

This sub level was opened in January on the Northwest side of the main eighth level from the crosscuts at raises #821-1, #822 and #823. Development drifts were first pushed to the Northeast 90' or to the mining limit. Sub raises from these crosscuts were put up to the hanging where mining started on the 635' sub level; the ore being transferred on this 660' sub.

Raise #854 from the Southeast end of the eighth level proved that ore existed above this sub level. A drift was driven to the Southeast from the hanging side of #821 raise and cut the foot wall just beyond #854 raise, after drifting 280'. This drift encountered jasper, ore, dike, slate and faulted pieces of ore near #854 raise, beyond which the foot wall was reached.

Development from this Southeast crosscut was extended to the Southwest and Northeast. In the former, opposite #852 raise, the drift extended 120', the last 35' in foot wall slate. Two dikes crossed this drift in a nearly

East and West direction. A manway from the 695' sub level later in the year connected with this drift.

The development to the Northeast starting from #853 raise extending 320' in ore. A crosscut to the Southeast was started 170' from the raise and extended 180' where it cut the foot wall, which showed the strike practically East and West and dipping 60° to the North. The first 10' of this drift was in ore, when a dike 20' in width was cut and later two small dikes running Northeast and Southwest were crossed. The balance of the drift was in ore. Development raise #814-1 was extended towards the hanging, but was abandoned at 60' above the rail on account of caving ore. The position of the large dike was determined further to the Northeast by a stub drift. This sub level will hole to the #811 raise from the eighth level early in the year.

675' SUB LEVEL.

This sub level all on the Northwest side of the main eighth level was opened in May. The mining limit was 20' Northeast of 820 crosscut and the sub level extended to the jasper hanging 50' Southwest of the 840 crosscut. A manway drift and raise was extended from #821 raise to the 660' sub level from the South end of this sub. Work here has been completed.

685' SUB LEVEL.

This sub level which is nearly at the elevation of the seventh level was started in May at #844 raise in a small piece of ore in the hanging. The main ore body at this elevation was developed on the completion of the 675' sub level above. Mining under the hanging has been completed and is now in progress in the pillars along #821, #822, and #823 raises.

SEVENTH LEVEL.

Two raises have been put up from the eighth level shaft pocket to the elevation of the seventh level and a connecting drift has been driven between them. A small plat will be cut out after which raises will be pushed through to the sixth level. These raises will take the place of the regular pocket at the shaft so that the eighth level skip tender, temporarily at least, will

handle the ore from the sixth, seventh, and eighth levels through the eighth level pocket.

695' SUB LEVEL.

This sub level was started in March at #861 raise which developed a small lense of ore on the foot. Later, development under the hanging was started at #844, #842 and #823 raises and in December at #822 raise. This is practically all on the Northwest side of the main eighth level crosscut.

720' SUB LEVEL.

Developments between the South foot and the jasper were started in March at #861 and #862 raises and in May at #842 in under the jasper hanging. Work here has been abandoned temporarily.

735' SUB LEVEL.

A small area has been mined near the South foot at #861 and #862 raises. Work was started in June.

745' SUB LEVEL.

An area 270' long and averaging 30' in width has been mined along the South foot wall between the slate and jasper from #861 and #862 raises. Work started in September.

760' SUB LEVEL.

This sub level was started in October at #862 raise. The development has been wholly to the West. At #861 raise a drift has been driven Northeast for 50 feet.

EIGHTH LEVEL.

The only drifting on this level was in 810 crosscut which is the first crosscut to the Southeast. The curve from the main shaft crosscut had been driven last year. From the end of this curve the crosscut was driven Southeast for 250'. The material throughout most of the entire length was lean, showing a run of ore about 60' back from the breast. In this crosscut, late in the fall, at a point 80' Southeast of the main crosscut, #811 raise was started. On the 31st of December this raise was 164' above the level. This

will be pushed through to the elevation of the sixth level.

In the extreme Southwest end of the mine #918 raise from the ninth level holed through to the Southwest side of 860 crosscut. This improves the ventillation in this end of the mine and provides an outlet to the ninth level for the water.

In 850 crosscut to the Southeast, raise #852 and #853 were located. These after holing to the -660' sub level were carried through to the 540' and -515' sub levels, respectively, Jasper being encountered immediately above these sub levels.

NINTH LEVEL.

The main level drift towards the Bunker Hill boundary in the West end of the mine was extended 66' stoping at a point 34' East of the Bunker Hill line. At 100' East from this boundary raise #918 was started. This projected through to the eighth level and holed in to 860 crosscut. At 210' East of the Bunker Hill line raise #1023 from the tenth level has just holed to this level.

TENTH LEVEL.

At 210' East from the Bunker Hill line #10 raise was started on the South side of the main crosscut and holed through to the ninth level at a point about 10' North of the main crosscut. This provides circulation between the ninth and tenth levels which helps to improve the ventillation in the mine. It also helps to preserve the timber which rots very quickly where there is lack of circulation.

ATHENS-NEGAUNEE MINE CONNECTING DRIFT.

The Athens-Negaunee connecting drift was started on the eleventh level Negaunee in October 1918. This was continued without interruption and holed in June to the Athens shaft. The distance drifted being 961 feet. The elevation at the Athens to which this holed is practically 1,000 feet from surface and is 800' above our top working level. This provides an outlet between the two mines. Practically the entire drift was in Jasper formation.

UNDERGROUND IN GENERAL.

From the above it will be seen that the mining has been started under the original scheme of working from the lower end of the deposit towards the top by starting operations directly under the hanging. The ore extending to such a height above the eighth level workings has made the area available for stoping comparatively small, confining it between the eighth level crosscut and the dike to the North. On account of the limited size of this area a new territory will have to be developed in order to get the desired product. On the South side of the main eighth level crosscut, the development from #852 and #853 raises has followed the ore practically to the fourth level or nearly 400' above. It is impossible to do economical mining through raises of this height, consequently the opening of the sixth level is now in progress. It will probably be April or possibly later before the inside workings on this level, where development is now in progress, will be connected with the shaft. It is hoped in the meantime, that raises from this level will reach the top of the ore so that mining can start there under the hanging.

The fourth level development to the West will be continued until a connection is made with the workings above the eighth level and exploration above the fourth on the East end of the Corbit Lease will be continued in the high sulphur sections.

The water pumped for the year was 85,503,850 gallons or an average of 163 gallons per minute.

A portion of this water is coming from the drill hole on the eighth level #1 crosscut where the diamond drill hole to the North struck water under pressure. It was decided best to drain this territory as much as possible. The flow here has considerably diminished during the year.

PUMPHOUSE - TENTH LEVEL.

Early in February a bulkhead was built on the Southeast side of the present pumphouse so that work of enlarging the pumphouse to the Southeast could be started. Work of cutting the pumphouse started in March and in June the new room was completed. The additional room cut averaged about 20 by 40. This

gives the area of this South pumphouse about 40 by 45. The foundation for the second 500-gallon Prescott pump located here was completed in July and the pump installed in September.

HIGH SULPHUR.

As mentioned elsewhere in the report high sulphur was encountered in the Corbit Lease on the South side of the deposit near the Lucky Star shaft line in the developments on the 170' sub level. By the end of the year sufficient exploration had not been completed to outline the limits of this high sulphur zone. The sulphur zone was crossed for a distance of 20' by drifting and 15' by means of drilling. The sulphur was in a form of gypsum in very small flakes which were dissipated through the ore. There was no apparent incomformity or slip of the formation or a break of any way where this occurred. The average analysis found here was 1.43. It was impossible to continue the explorations in this ore as it had to be dumped on the stockpile with our other ores and there was danger of contaminating the stockpile. Further exploration is under way on the 215' sub level to help outline the deposit.

CORBIT LEASE.

Practically all of the developments above the fourth level on the various sub levels, which have been gone into in detail in the general report, were on Lot 13 which represents the Corbit Lease. Here high sulphur ore was found on the 170' sub level which will make a certain tonnage on this lease unmerchantable. The development on this Lease has not been finished.

MITCHELL LEASE.

The Mitchell Lease comprises Lots 8, 9 and 11. The ore mined from these parcels during the year was all from development on the fourth level. The shaft is located on Mitchell Lease, Lot 9, consequently the work near the shaft, such as the raise from the eighth to the sixth level and the cutting out of the new pump station were on this property.

EXPLORATIONS.

Nine holes were drilled underground at the Athens Mine during the year, two of which were on the Bunker Hill property and were the continuation

of the work in progress last year, to determine the depth of the deposit at the Bunker Hill line. Seven holes on the Athens were all horizontal, three of which were drilled early in the year and four during the latter part; all for the purpose of assisting development of the deposit.

The work in detail at each hole was as follows:-

Bunker Hill, hole #3, drilled from tenth level Athens, coordinates South 3433.60 West 1931.76; dip -46° South; direction South $86^{\circ} 14'$ East; elevation of collar -993.92, material, ore 0 to 63; mixed ore and dike 63 to 75; dike 75 to 94, bottom.

Bunker Hill, hole #4, drilled from tenth level Athens, coordinates South 3438.32 West 1935.58; dip -30° ; course South $3^{\circ} 03'$ West, elevation of collar 992.92; material 0 to 67 ore; dike 67 to 100, ore 100 to 119, paintrock 119 to 128; ore 128 to 170; decomposed slate 170 to 223.

Athens, hole #4, eighth level, coordinates 3530 South and 1755 West; dip, horizontal; direction North 30° West; elevation of collar -779.85; material 4 to 11 lean ore; ore 11 to 30; lean ore 30 to 55; soft ore jasper and lean ore 55 to 110; ore 110 to 135; lean ore and jasper 135 to 162; diorite 162 to 170.

Athens, hole #5, -695' sub level; coordinates South 3682.87 West 1696; dip 0° ; South $35^{\circ} 04'$ West; elevation of collar -696; material, slate 0 to 219; quartzite 219 to 223; graywacke 223 to 260.

Athens, hole #6; -695' sub level; coordinates South 3657 West 1696; dip 0° ; direction North $2^{\circ} 47'$ West; elevation of collar -694.40; material, soft ore jasper 0 to 55; lean ore 55 to 80; soft ore jasper with a few lean ore runs 80 to 195; ore 195 to 200, lean ore 200 to 202.

Athens, hole #8, -515' sub level; location South 3772 1440 West; dip 0° ; South $20^{\circ} 10'$ West; elevation of collar -514; material 0 to 8 soft ore jasper; mixed slate and jasper 8 to 15; slate 15 to 255; transition jasper and slate 255 to 274; slate 274 to 300.

Athens, hole #9; fourth level; location South 3581 West 578; dip 0° ; direction South $76^{\circ} 11'$ West; elevation of collar 390.6; material soft ore

jasper 0 to 55; ore 55 to 60; soft ore jasper 60 to 80; ore 80 to 105; lean ore 105 to 110; ore 110 to 120; lean ore 120 to 225.

Athens, hole #10, fourth level; location South 3573 West 538; dip 0°; direction North 52° 30' West, elevation of collar -390.7; material soft ore jasper 0 to 55; lean ore 55 to 60; soft ore jasper 60 to 95; lean ore 95 to 98; soft ore jasper 98 to 175. Hole finished December 6th, 1919.

PUMPING PLANT.

At the beginning of the year we were having difficulty with the 500-gallon pump installed in the tenth level pumphouse. One of the crossheads had broken and the pump was operating on one side. By this means we were able to take care of the flow of water which was somewhat less than 200 gallons per minute. I mentioned in my last annual report that a crack had appeared in one of the cylinders. After the new crosshead was supplied, this cylinder crack became worse until finally it was necessary to provide a new cylinder. The castings on these pumps are all made of cast steel but they appear to be spongy in places and to date have shown that they are not strong enough to withstand the tremendous pressure. This 500-gallon pump delivers the water from the 2400' level direct to surface without relaying. The North pump has been in operation now slightly over a year and to date two cylinders have had to be replaced on account of breaking down and a third has been ordered to replace another which has started to give us trouble. Several crossheads have been sent us for those broken in service.

The second pump installed in the new pumphouse at this station is a duplicate of the one installed in the North pumphouse. Both were made by the Prescott Company of Menominee, Michigan, and are of the horizontal plunger type, electrically driven.

During the latter part of the year two of the flanges in our pump column cracked at a point 700' from surface. This will necessitate taking out one section of the column and installing two short pieces to fill up the gap. The flanges which broke are of cast iron.

SHAFT.

During the year a wire netting was installed between the ladder, pipe, and the cage compartments. This reached from surface to the bottom of the shaft.

A spare submarine cable was installed in the shaft in April. This extends to the ninth level and enters the pumphouse through the raise which connects the pumphouse with the ninth level near the shaft. It was provided for use in case of an emergency.

FATAL ACCIDENTS.

We were unfortunate in having two fatal accidents during the year both of which were caused by falls of ground.

The first occurred on the 660' sub level on the night of May 1st in which Andrew Barlund was killed. Barlund attempted to drill a hole in the back of his working place, but instead of standing under the protecting timber, he went beyond. A piece of ore weighing about two tons fell, knocking him down and rolling over him, killed him instantly. A few minutes before the accident, a miner working near his place visited this contract and told Barlund that he considered what he was doing as dangerous. The accident was wholly due to his carelessness.

On October 9th, John Luoma was so seriously injured by a piece of ore which fell from the side of the drift on him, that he died two days later at the Negaunee Hospital. At the time of the accident Luoma was preparing a place for a set of timber. The pillar to the left was somewhat crushed and the piece fell without warning, cutting his scalp, dislocating his hip and causing a compound fracture of his left leg. His death resulted from a blood clot in one of the arteries reaching his brain. The piece of ore which fell had been tested only a few minutes before by the shiftboss and the men and was thought to be perfectly secure.

SURFACE.

Practically the only surface work during the year was in the latter

part of the season when a strip of 90' in width was graded to the East of our present stockpile. This provides room for a single stocking trestle. A section about 200' in length was graded to the Southeast as an extension of the present stocking ground to permit taking care of this season's product. In the latter place where a large yardage of sand had to be removed, a steam shovel and locomotive with dump cars was employed. Instead of providing the new stocking ground with plank as has been the case generally, a dressing of jasper eight inches in thickness was spread over the sand surface. This provides a satisfactory sollar and at a much cheaper cost than planking.

TRESTLES.

The main double ore trestle Southeast of the headframe was partially dismantled during shipping season. This was rebuilt and several bents added, which extends onto the new stocking ground. Four bents were erected for the new single trestle to the East; more will be erected if needed.

ROADWAY.

In June a roadway was built from the South side of the headframe around to the East connecting with the road system to the North.

SHIPMENTS.

The shipments from the stockpile for the year were as follows:-

Athens,	21,736 tons,
Mitchell Lease,	337 "
Corbit Lease,	<u>2,605</u> "
Total -	24,678 tons.

The shipments from the pocket for the year were as follows:-

Athens,	44,640 tons,
Mitchell Lease,	2,072 "
Corbit Lease	<u>3,109</u> "
Total -	49,821 tons.

PRODUCTION.

Month	Athens	Mitchell	Corbit	Total	Rock
January	5,248	.	836	6,084	2,524
February	8,172	312	280	8,764	1,452
March	8,432	1,116	1,088	10,636	1,116
April	9,908		1,656	11,564	1,012
May	9,716		1,870	11,586	840
June	11,193		1,815	13,008	648
July	12,869	249	482	13,600	304
August	10,501	2,261	227	12,989	1,176
September	10,636	535	117	11,288	1,264
October	12,773	659	726	14,158	1,388
November	11,672	1,196	60	12,928	2,044
December	11,196	2,528	464	14,188	1,100
Total	122,316	8,856	9,621	140,793	14,868

Of this product practically all the ore mined on the Corbit and Mitchell Leases came from development drifts.

COSTS.

The cost of production for the year 1919 was \$2.736 per ton and the total cost on stockpile was \$3.338.

The various items entering into these costs per ton were as follows:-

General Expense	\$22,182.14	Cost per ton \$.157
Maintenance	28,752.73	Do.	.204
Mining Expense	<u>334,345.52</u>	"	<u>2.375</u>
Cost of Production	\$385,280.39	"	\$2.736
Exploratory	4,466.53	"	.032
Depreciation	29,566.53	"	.210
Taxes	23,604.78	"	.168
Central Office	7,556.87	"	.054
Supply Inv. & Miscl.	<u>19,430.08</u>	"	<u>.138</u>
Total cost on Stockpile	\$469,905.18	"	\$3.338

These figures are shown on the December cost sheet. The following comments on a few of the principal items which might be of interest.

Item #30 Personal Injury Expense - amount \$6,275.28. This is high due principally to two fatal accidents for the year; Andrew Barlund on May 1st, and John Luoma on October 9th, 1919. Both were killed by falls of ground.

Item #126 Docks Trestles & Pockets - amount \$2,826.87, due principally to a large area to the East and Southeast of our present stockpile graded for stocking room.

Item #133 Top Tram Engine & Cars - amount \$1,839.61. One new top tram car and one car changed from saddle back to side dumper.

Item #135 Underground Tracks & Cars - amount \$2,095.95. Several new sub level cars built during the year, also a quantity of 12# rail used in sub levels.

Item #136 Electrical Tram Plant - amount \$11,775.99. The principal item in this amount is main line tracks which is high on account of extending tracks in the new main level drifts.

Three new main line cars built during the year.

Item #151 Compressors - amount \$19,079.61. This represents the cost of 414,045,000 cubic feet of air compressed during the year at a cost of \$.048 per 1,000 cubic feet.

Item #152 Hoisting - amount \$22,166.45. Represents the cost of hoisting 155,661 tons of which 140,793 were ore and 14,868 were rock. This product was hoisted from an average depth of 2137 feet.

Item #153 Pumping - amount \$16,365.46. There were 85,503,850 gallons of water pumped from the 2400' level station.

Item #155 Rock Drifting - amount \$30,581.63, represents 3246' drifted in rock.

Item #156 Breaking Ore - amount \$137,137.87 is the cost of breaking 130,793 tons of ore.

Item #157 Trimming - amount \$28,137.55, represents the total cost against this item. It is made up as follows:- actual trimming for year \$20,432.85, this represents 35,069 cars of ore trammed by electric haulage. Skip tenders \$6,299.50. Cleaning skip pit \$4,105.20.

Item #159 Timbering - amount \$55,551.31. The charges are very much higher than in ordinary mining on account of a great deal of raising, all of which is, close timbered, and main level drifts which require a large size timber.

CHARGES TO OPENING AND EQUIPPING
ATHENS MINE - 1919.

A total charge of \$15,004.07 was made during the year to the Opening and Equipping Athens Mine E.&A. #261 under the Superintendent's Division. The items entering into this amount were as follows:-

	Amount.	
Acct. No. 1 General Expense	\$ 81.61	For legal services during the year.
Acct. No. 4 Sinking in Rock	2,113.96	This charge was for installing di- vidings in the shaft, i.e., wire netting between the cage and ladder compartments.
Acct. No. 5 Drifting to Ore Body	6,072.66	This was the total cost over the Athens-Negaunee connecting' drift, 961'. The station at the Athens shaft will have to be enlarged somewhat, also bulkhead dams will have to be installed before this work is completed.
Acct. No. 6 Plats and Pockets	2,345.90	Steel plates installed in 8th and 4th level pockets.
Acct. No. 10 Permanent Equipment	2,755.42	Expended under #10-f Pumphouse and Sump. This is for enlarging the South pumproom.
Acct. No. 12 Laboratory Equipment	1,634.52	This represents the equipment re- ceived and paid for during the year.
Total	\$15,004.07	total amount expended and charged against the opening statement.

ACCIDENT TO EQUIPMENT.

There was an accident to the skip road and headframe which occurred September 26th at 9:15 P.M. when the brakeman pulled the skip too high. The skip after dumping was pulled into the top of the headframe breaking the channel iron which crosses the shaft above the dump. The jar broke the top sheave and cut off the rope. The skip dropped on to the top of the dump and jammed there. This was due entirely to carelessness on the part of the brakeman. The accident happened on Saturday and made a delay only of one day with an estimated loss of 580 tons of ore.

DELAYS - ELECTRICAL.

May 28th	One hour, no current - no tonnage lost.
June 5th	One hour and forty minutes delay on account of electric current.
November 18th	Two hours delay, no current from 3 to 5 o'clock A.M.
December 8th	Five hours delay on account of electricians working on motor on skip hoist.

DELAYS - NON ELECTRICAL.

June 16th	Delay from 9 o'clock P. M. to 7 A.M. account of a bearing on skip hoist generator set ran hot.
September 26th	Six hours delay, skip hoisted too high, top sheave broken.
September 27th	16 hours idle. Do.

ESTIMATE OF ORE RESERVES DECEMBER 31, 1919.

Assumption 12 cu. ft. equals one ton.

10% deduction for rock.

10% " " loss in mining.

Percentage of Bessemer equals 0.

Developed ore:

Fourth level and above	1,214,996 net tons,
660' sub to 4th level, North of dike	716,417 "
8th Level to 660' sub, North of dike	837,388 "
8th Level to 9th Level	479,455 "
9th Level to 10th Level	253,382 "
Below 10th Level	<u>52,185</u> "
Total developed ore -	3,553,823 net tons.

Prospective ore:

Fourth level to 660' sub, South of dike	1,983,577 net tons,
Eighth " " " " " " "	<u>222,021</u> "
Total prospective ore -	2,205,598 net tons.

ESTIMATED ANALYSES.

	<u>IRON</u>	<u>PHOS.</u>	<u>SILICA.</u>	<u>ALUM.</u>	<u>MANG.</u>	<u>LIME.</u>	<u>MAG.</u>	<u>SUL.</u>	<u>IGNI.</u>	<u>MOIST.</u>
Dried 212°	59.50	.132	8.00	3.00	.53	.80	1.00	.021	2.00	
Natural	51.32	.114	6.90	2.59	.47	.69	.86	.018	1.73	13.75

ATHENS MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR 1919.

GRADE	IRON	PHOS.	SILICA
Athens,	59.83	.131	7.58
Mitchell Lease,	59.98	.126	6.38

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR 1919.

GRADE	Mine		Lake Erie	
	IRON	PHOS.	IRON	MOIST.
Athens,	59.99	.137	60.25	12.50
Mitchell Lease,	(All Mixed).			

ORE STATEMENT - DECEMBER 31ST, 1919.

	ATHENS	MITCHELL LEASE	CORBETT LEASE	BUNKER HILL	TOTAL	TOTAL LAST YR.
On hand January 1st, 1919,	13,222		1,496	284	15,002	530
Output for Year,	122,316	8,856	9,621		140,793	37,568
Total,	135,538	8,856	11,117	284	155,795	38,098
Shipments,	66,376	2,409	5,714	0	74,499	23,096
Balance on hand,	69,162	6,447	5,403	284	81,296	15,002
Increase in output-274%					103,225	
Increase in ore on hand,					66,294	

1919 - 2-8 Hour Shifts

1918 - 2-8 Hour Shifts.

ATHENS MINE.

ATHENS MINE

SHIPMENTS FOR YEAR 1919.

GRADE	POCKET	STOCKPILE	TOTAL
Athens,	44,640	21,736	66,376
Mitchell Lease,	2,072	337	2,409
Corbett Lease,	3,109	2,605	5,714
Bunker Hill,	0	0	0
Total,	49,821	24,678	74,499
Last Year,	23,096		23,096
Increase - 223%			51,403

ATHENS MINE.

ATHENS MINE.

COMPARATIVE MINING COST FOR YEAR.

	1 9 1 9 .	
PRODUCT	140,793	
General Expense	.157	
Maintenance	.204	
Mining Expense	2.375	
Cost of Production	2.736	
Exploratory	.032	
DEPRECIATION		
Construction (Opg)	.210	
Total Depreciation	.210	
Taxes	.168	
Central Office	.054	
Miscellaneous	.138	
Cost on Stockpile	3.338	
Loading & Shipping	.035	
Total Cost on Cars	3,406	
No. Days Operating	298	
No. Shifts & Hours	2-8hr	
Avg. Daily Product	472	
<u>COST OF PRODUCTION.</u>		
Labor	1.886	
Supplies	.850	
Total	2.736	

This mine started on an operating basis January 1, 1919.

ATHENS MINE.

COMPARATIVE WAGES AND PRODUCT.

	1 9 1 9.
PRODUCT	140,793
No. Shifts and Hours	2-8hr
AVERAGE NO. MEN WORKING	
Surface	37
Underground	112
Total	149
AVERAGE WAGES PER DAY	
Surface	5.00
Underground	6.20
Total	5.90
WAGES PER MONTH OF 25 DAYS	
Surface	125.00
Underground	155.00
Total	147.50
PRODUCT PER MAN PER DAY	
Surface	12.56
Underground	4.20
Total	3.15
LABOR COST PER TON	
Surface	.398
Underground	1.476
Total	1.874
AVG. PRODUCT BRK'G & TRM'G	6.25
" WAGES CONTRACT MINER	6.89
" " " TRAMMER	0
" " " LABOR	6.89
TOTAL NUMBER OF DAYS	
Surface	11,205
Underground	33,501
Total	44,707
AMOUNT FOR LABOR	
Surface	56,021.72
Underground	207,831.13
Total	263,852.85

Mine started on operating basis Jan. 1, 1919.

Proportion Surface to Underground Men:
1919 - 1 to 3.

ATHENS MINE.

TIMBER STATEMENT FOR YEAR ENDING DECEMBER 31, 1919.

KIND.	LINEAL FEET.	AVG. PRICE PER FOOT.	AMOUNT 1 9 1 9.
4" to 6" Timber	28,552	.03	855.88
6" to 8" "	98,272	.0387	3,798.74
8" to 10" "	53,316	.068	3,634.32
10" to 12" "	18,934	.112	2,125.41
12" to 14" "	6,756	.153	1,037.10
Total - 1919	205,830	.0556	11,451.45
	LINEAL FEET.	PER 100'	
7' Lagging	751,760	.979	7,362.86
Poles	72,020	.851	612.55
Total - 1919	823,780	.967	7,975.41
Product for year			140,793
Feet timber per ton ore			1.46
Feet Lagging "			5.34
Feet Lagging per foot of Timber			3.65
Cost per ton for Timber			.0813
"	Lagging		.0523
"	Poles		.0044
"	Timber, Lagging & Poles		.1380
Equivalent of still timber to Bd. Measure			307,749
Feet Bd. Measure per ton of ore			2.186
Total Cost for timber, lagging & Poles - 1919			19426.86

ATHENS MINE.

STATEMENT OF EXPLOSIVES USED FOR BREAKING ORE.

KIND.	QUANTITY.	AVERAGE PRICE.	AMOUNT 1 9 1 9.
40% Powder	45,500	.1671	7604.52
60% "	14,000	.2103	2944.73
Total Powder	59,500	.1773	10549.25
Fuse	212,300	8.80	1866.29
#6 Caps	33,700	14.10	476.29
Cap Crimpers	38	.46	17.40
Total Fuse,			2359.98
Total All Explosives,			12909.23
Product			140,793
Cost per ton for Powder			.423
" Fuse, Caps, Etc.			.0168
" All Explosives,			.0917
Avg. Price per Lb. for Powder			.1773

SOUTH JACKSON MINE - 1919.

The product from this property for the season 1919 was 56,840 tons. Practically all of this came from the open pit near the Lucy line with the exception of a small amount that was obtained from the drifts at the tunnel level.

OPEN PIT.

Operations started in the open pit the latter part of April. It had been determined to try loading by means of steam shovel, although it was a question whether a satisfactory mixture could be obtained, but as this method would be cheaper than any other, it was decided to make the experiment. A steam shovel was moved to the pit early in May and placed alongside of the cut which had been made through the pit to the Southeast into the Lucy Pit just North of the section corner. The result of the loading was satisfactory and the shovel was employed throughout the season. There were times the ore was slightly off grade, but by maintaining two breasts and arranging so that the shovel could be moved quickly from one to the other, the product was kept uniform. During the season about two and one-half cuts were made through the bottom of the pit, except North of the section corner where the banks are high. Here a cut and one-half was made. In the Lucy Pit it was necessary to employ the shovel for a short time in filling the bottom of the pit up to the track level, so that tail room could be obtained for the railroad cars.

During the last two or three years, the best product from the pit has come from the South end and the Southeast corner; that on the North side had been quite lean, but by combining with the South side ore, a satisfactory product had been maintained. It was expected in steam shovel loading, that the ore on the North side would be lean and would have to be mixed with the South side ore to "sweeten" it. We found, however, while the North side kept up to guarantee or well above, that a great deal of difficulty was had with the ore from the South side. Here an old incline shaft and drift were en-

countered filled with sand, also several dikes cut through the formation which did not show on surface. This material had to be separated, loaded and hauled away from the pit, but some of the good ore was contaminated by the sand and rock, and gave us considerable trouble in making our guarantee.

In order to facilitate the moving of the shovel from one breast to another, it was necessary to supply the pit with extra loading track, 900 feet of which was layed during the year. This was charged to the operations and included in the cost of production. Most of the loading was done by spotting the cars by hand, a down grade being maintained, however, there were times on account of little tail room, when it was necessary to employ a spotting engine to give us satisfactory car service. When spotting by hand, cars were furnished by the Railroad Company, who would give us two spots a day; refusing to come to the pit oftener than that, unless continuous service was demanded, at which time we were required to pay the hourly charge of \$7.50. This action by the Railroad Company was unreasonable at times, and made an expensive proposition for the mine, as nearly every day there was idle time when nothing could be done by the steam shovel crew. The Railroad Company's service at this pit has been anything but satisfactory and last year was no exception to the rule.

In addition to the steam shovel crew, four miners were engaged in drilling and blasting in front of the shovel, breaking up large chunks or in preparing the breast. In August a churn drill was brought to the pit. Eight holes were drilled in the high bank on the North side and five on the bank to the South. Those on the North averaged 48' in depth. On September 13th, the first four holes on the North side were blasted at one time, 2450 pounds of powder being used. This broke off the entire side of the cut for 25 feet which gave us ore from this side for the balance of the season; although some of the slabs were so large as to require extra drilling and blasting. The latter part of September a churn drill hole 63' deep near the section corner on the South side of the pit was blasted; 1350 pounds of powder was used here which shattered a very large volume, the full extent of which has not been

determined.

UNDERGROUND.

There remains above the level of the old pit about one season's product. When it is impossible to do further steam shovel loading, it will be necessary to mine by means of milling. The mill drifts have been started at the tunnel level which is about 60' below the collar of the shaft, or at an elevation of 1384.7. Last year a drift was extended to the West in the direction of the old manganese pit. It was continued this year and the breast at present is 250' to the West of the shaft. In the Southwest end of the pit, the drainage tunnel was extended 140' to permit milling to start in that territory. This drift in August holed into an old stope which was filled with water. The present breast is 40' beyond this stope and raises will be pushed through to the bottom of the pit during the coming season. The drift on the Southeast side of the shaft was extended 60' to the South. The underground drifting was greatly retarded during the past season on account of insufficient air pressure.

SHAFT.

During the year two cuts were made in the bottom of the shaft to provide a small skip pit and a chute, so that the ore could be loaded into the skips more readily.

COMPRESSOR.

Before work starts the coming season a larger air compressor should be provided for this mine. The present compressor has a capacity of 300 cubic feet per minute and is not large enough to supply the air for the underground drilling and for the two machines which have to run almost continually in the pit. If greater progress cannot be made with the underground drifting, it will be impossible to obtain the season's product by milling in the year 1921, as sufficient territory cannot be developed for milling operations.

ENGINE SERVICE.

As mentioned above the Jackson Pit has received extremely poor engine service and a great deal of time has been lost on this account. The

yard foreman at Ishpeming is extremely arbitrary and last year there was a continuous wrangle with his office in order to get service. To do cheap mining in this pit, there should be as little loss of time on the part of the shovel crew as possible. In order to help the situation, I would recommend that a Company spotting engine be employed at this pit. The Company owns an engine which was used for removing the rock pile at the old Moro. I understand this is of sufficient size to spot one or two loaded cars. If such is the case, I believe it would be to our advantage to use it at this pit. I would recommend that it be overhauled, if necessary, and tried out here during the coming season.

MINING METHOD.

The steam shovel method will be employed during the coming season if a proper mixture can be maintained, if not, the only other possible method will be milling. The latter method, while it might give a more uniform product, will be more expensive as all of the ore will have to be trammed underground, therefore, it is to our advantage to employ the steam shovel as long as possible. If the Company locomotive proposition works out satisfactorily, it is possible that steam shovel mining can be done beyond the present season, if the locomotive is able to haul loaded cars up grade. Milling drifts will be extended as rapidly as possible in order that they may be available in case it is necessary to use them to regulate the grading.

EXPLORATIONS.

The churn drill holes in the Southeast end of the pit were recorded by the Geological Department as regular exploration holes in order that a proper record might be kept, however, these were drilled wholly to be used in breaking the bank. The analyses were kept in order to show the grade of ore. In one or two of the holes on the North side a few runs of high manganese ore was found.

Hole #119. Location Negaunee Coordinates, South 4055 West 7700; dip 90°; elevation of collar 1453; depth December 31, 1918 1245 ft. Material

reported last year in this hole was 0 to 510 ' soft ore jasper with runs of lean ore.

	FROM	TO	MATERIAL
	510	1245	Soft ore jasper.
	1245	1252	Lean ore.
	1252	1385	Soft ore jasper.
	1385	1451	Dike.
	1451	1483	Soft ore jasper, dike and quartz.
	1483	1545	Soft ore jasper.
	1545	1570	Dike, jasper and dike.
	1570	1647	Soft ore jasper.
	1647	1744	Greenstone.

Hole finished May 5th, 1919.

STRIPPING.

In the Southeast end of the Jackson Pit on both the North and South side areas were stripped during the year. On the North side the stripping was about 50' in width and 250' in length, while on the South side the area around the section corner and to the East was cleaned back as far as the East edge of the old Lucy Pit. On both sides stripping from former years had to be rehandled. To the West of the crusher building a territory about 400' long and 200' in width was stripped in the territory known as the manganese strip. Most of this was removed by scraper although a considerable quantity will have to be handled by hand before the actual mining starts.

SOUTH JACKSON ESTIMATE DECEMBER 31, 1919.

Above present pit available by present system of mining:

On Southwest side - - - - - 35,000 tons,
 North of Lucy Pit - - - - - 25,000 "
 South and Southwest of Lucy Pit - - - 25,000 "

TOTAL - 85,000 tons.

Below present pit and above drainage tunnel
 available by milling:

West of Crusher - - - - - 186,967 tons,
 Area A below bottom present pit by
 churn drilling - - - - - 110,000 "
 Probable extension of Area A East
 onto Lucy Pit - - - - - 90,000 tons,

TOTAL - 386,967 tons,

GRAND TOTAL - 471,967 tons.

Mined during the year - 56,840 tons,

Balance December 31st, 1919 - 415,127 tons.

ANALYSES

	IRON	PHOS.	SUL.	MANG.	MOIST.	SIL.
Natural	36.83	.066	.010	2.00	7.00	31.56

SOUTH JACKSON MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR 1919.

GRADE	IRON	PHOS.	SILICA	MANG.
South Jackson,	37.73	.058	36.49	2.54

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR 1919.

GRADE	IRON	Mine			Lake Erie		
		PHOS.	SIL.	MANG.	IRON	MANG.	MOIST.
South Jackson,	37.56	.058	36.51	2.68	39.28	3.03	7.42

ORE STATEMENT AND SHIPMENTS FOR YEAR 1919.

	YEAR	LAST YEAR
Output for Year,	56,840	15,879
Shipments,	56,840	15,879
Balance on hand,	0	0

1919 - 1-10 Hour Shift - May 10th to October 6th

1918 - 1-10 Hour Shift - May 28th to November 13th.

SOUTH JACKSON MINE.

SOUTH JACKSON MINE.

COMPARATIVE MINING COST FOR YEAR.

	1919.	1918.	INCREASE.	DECREASE.,
PRODUCT	56,840	15,879	40,961	
General Expense	.036	.073		.037
Maintenance	.007	.282		.275
Mining Expense	.436	.712		.276
Crushing	.125	-	.125	
Stripping	.018	.529		.511
Cost of Production	.622	1.596		.974
Exploratory	-	.607		.607
DEPRECIATION.				
Original Purchase	.803	.803	-	
Total Depreciation	.803	.803	-	
Taxes	.037	.115		.078
Idle Expense	.017	.054		.037
Central Office	.013	.059		.046
Miscellaneous	.008			.008
Supply Inventory	-	.001		.001
Sundry Expense	.007	.006	.001	
Cost on Stockpile	1.491	3.241		1.750
Loading & Shipping	.008	.136		.128
Total Cost on Cars	1.499	3.377		1.878
No. Days Operating	100	83	17	
No. Shifts and Hours	1-10hr	1-10hr		
Avg. Daily Product	568	103	465	
COST OF PRODUCTION.				
Labor	.325			
Supplies	.297			
Total	.622			

SOUTH JACKSON MINE.

COMPARATIVE WAGES AND PRODUCT.

	1 9 1 9.	1 9 1 8.	INCREASE.	DECREASE.
PRODUCT No.Shifts and Hours	56,840 1-10hr	15,879 1-10hr	40,961	
AVERAGE NUMBER MEN WORKING				
Surface	7½	4	3½	
Underground	4½	7		2½
Total	12	11	1	
AVERAGE WAGES PER DAY				
Surface	5.32	4.76	.56-12%	
Underground	5.92	4.36	1.56-36%	
Total	5.51	4.58	.93-20%	
WAGES PER MONTH OF 25 DAYS				
Surface	133.00	119.00	14.00	
Underground	148.00	109.00	39.00	
Total	137.75	114.50	23.25	
PRODUCT PER MAN PER DAY				
Surface	25.90	11.83	14.07	
Underground	53.38	7.90	45.48	
Total	17.44	4.74	12.70	
LABOR COST PER TON				
Surface	.205	.416		.211
Underground	.111	.551		.440
Total	.316	.967		.651
TOTAL NUMBER OF DAYS				
Surface	2,194½	1,342	852½	
Underground	1,065	2,008		943
Total	3,259½	3,350		90½
AMOUNT FOR LABOR				
Surface	11,676.19	6,608.21	5,067.98	
Underground	6,303.37	8,751.39		2,448.02
Total	17,979.56	15,359.60	2,619.96	

PROPORTION Surface to Underground Men:

1919 - 1 to .6
 1918 - 1 to 1.75
 1917 - 1 to 6.5
 1915 - 1 to 5.
 1914 - 1 to 13.

NORTH JACKSON - 1919.

There was no mining done at the North Jackson property during the year.

TRESTLE.

The trestle extending through Cornishtown from the L. S. & I. tracks to the North Jackson open pit headframe was dismantled during the year and the timber sent to Republic for stocking trestle. Most of the planking and legs were badly rotted, but the stringers and caps were all in good shape and could be used with very little loss.

CONSTABULARY BARRACKS.

The North Jackson office which has been used as the Upper Peninsula Headquarters for the Michigan State Police had extensive repairs made during the season. A foundation was placed under the center of the building; a steam heating plant installed; modern plumbing was also placed in the building, which included shower baths, water closets and wash stands. New sills were provided under portions of the building where necessary and the walls throughout were covered with plaster board. A porch for the front of the building has been authorized and will be built early the coming season.

In the old Jackson barn, the passage back of the stalls had to be renewed. Concrete was placed here and drains connected to the sewer.

EXPLORATIONS.

Hole #131 located on top of the hill between the North and South Jackson properties; Location Negaunee coordinates 7400 West 3400 South; elevation of collar 1576.8; dip 90°.

FROM	TO	MATERIAL
0	4	Surface.
4	110	Hard ore jasper with lean ore.
110	158	Lean ore.
158	166	Hard ore jasper.
166	195	Soft ore jasper.

Hole #131 - Continued.

FROM	TO	MATERIAL
195	1583	Soft ore jasper with occasional runs of lean ore with dike from 713 to 756.
1583	1998	Greenstone.
1998	2142	Soft ore jasper.
2142	2150	Dike.
2150	2174	Jasper.
2174	2178	Dike.
2178	2207	Soft ore jasper.
2207	2213	Magnetic siderite and grunerite, dike.
2213	2216	Dike.

LUCY MINE - 1919.

The only work done at the Lucy Mine during the year was to the Northwest of the shaft where the Jackson Pit broke through into the old Lucy Pit and where mining operations were conducted by steam shovel during the past season. The territory immediately adjacent to this old pit on the North and South sides was stripped. Here a large volume of stripped material which had been thrown back in previous years, had to be rehandled and taken to a place where it would not interfere with future mining operations.

MORRIS LLOYD MINE.

GENERAL

This property was operated as vigorously as labor conditions would permit during the entire year. We have been short of labor all the year notwithstanding the fact that we have maintained a force of 10% in excess of last year.

The total production and tons per man show a decrease as compared with last year due to our loss in open pit tonnage which was mined and included in the 1918 production.

The only new work accomplished on surface during the year was the changing of the course of the Carp River where it passes the Morris mine. There is a stope which has been worked up above the first level, Morris mine, to a point where it leaves approximately 250 feet of Jasper Capping. This capping is very friable and may cave to surface and it was deemed advisable to have this stream of water carried to a safe distance from the point at which this stope might cave through.

Underground conditions are about the same as last year. During the current year the Morris shaft has been sunk an additional 250 feet to the 7th level at an elevation of 1450 feet from surface. We have also been driving two main level drifts in rock; one west across Chase leases Nos. 24 and No. 25 and one east from the Morris shaft to explore the territory contiguous to the Lloyd shaft. If this ground shows sufficient ore to warrant it a crosscut will be driven to the Lloyd and the shaft raised. This drift is 400 feet below the present bottom of the Lloyd shaft.

The twelve new tenant houses which were underway at the close of last year have been completed and the fences will be placed and streets graded during the coming season.

MORRIS LLOYD MINE.

LABOR

We have found it very difficult to maintain an efficient force of men at any time during the year. It has been particularly hard to get a sufficient number of trammers.

The following statement shows the number of men employed each month on surface and underground and the four previous years for comparison, - Viz:

MEN EMPLOYED.

	SURFACE					UNDERGROUND					TOTAL				
	1915	1916	1917	1918	1919	1915	1916	1917	1918	1919	1915	1916	1917	1918	1919
JAN.	48	64	49	50	49	203	242	240	208	206	251	306	289	258	256
FEB.	49	59	47	47	46	200	245	230	194	206	249	304	277	241	252
MAR.	53	62	51	46	46	214	253	230	201	217	267	315	281	247	263
APR.	47	62	46	40	46	188	247	229	184	213	235	309	275	224	259
MAY.	50	61	44	48	53	216	240	220	198	214	266	301	264	246	267
JUN.	54	60	44	39	50	201	237	216	202	232	255	297	260	241	281
JUL.	54	65	43	41	52	194	232	207	201	214	248	297	250	242	266
AUG.	63	61	42	45	50	197	225	187	195	216	261	286	229	240	266
SEP.	56	59	46	44	49	210	210	177	186	201	266	269	223	230	250
OCT.	58	55	45	48	50	206	219	181	182	205	264	274	226	230	255
NOV.	57	53	48	47	48	217	216	174	164	201	274	269	217	212	249
DEC.	57	48	41	48	51	234	222	176	174	212	291	270	217	222	263
AVG.	54	59	45	45	49	207	232	206	191	214	261	291	251	236	263

It will be noted from above that we have averaged a total of 27 men over last year. We are, however, still short about 40 men which we need to carry on the work we have planned.

Our labor costs per ton average 34% increase over 1918 and are shown in the following statement with previous years for comparison, - Viz:

COST PER TON FOR LABOR

	SURFACE					UNDERGROUND					TOTAL				
	1915	1916	1917	1918	1919	1915	1916	1917	1918	1919	1915	1916	1917	1918	1919
JAN.	.205	.228	.180	.225	.294	1.027	1.043	.946	1.036	1.363	1.232	1.271	1.126	1.261	1.657
FEB.	.211	.219	.178	.237	.279	1.003	1.072	.888	1.017	1.347	1.214	1.291	1.066	1.254	1.626
MAR.	.175	.175	.173	.193	.267	.844	.831	.853	.952	1.394	1.019	1.006	1.026	1.145	1.661
APR.	.181	.189	.172	.205	.310	.878	.836	.876	.985	1.545	1.059	1.025	1.048	1.190	1.855
MAY.	.160	.180	.159	.202	.290	.856	.757	.897	.927	1.320	1.016	.937	1.056	1.129	1.610
JUN.	.169	.161	.176	.166	.251	.755	.702	.960	.907	1.320	.924	.863	1.136	1.073	1.571
JUL.	.151	.180	.166	.181	.293	.673	.722	.907	.904	1.374	.824	.902	1.073	1.085	1.667
AUG.	.20	.161	.170	.212	.276	.753	.671	.851	.992	1.374	.953	.832	1.021	1.204	1.650
SEP.	.163	.182	.198	.212	.280	.746	.700	.869	.985	1.267	.909	.882	1.067	1.197	1.547
OCT.	.164	.174	.229	.213	.258	.74	.735	.954	.980	1.217	.904	.909	1.183	1.193	1.475
NOV.	.163	.187	.232	.354	.307	.772	.798	.977	1.335	1.389	.935	.985	1.209	1.689	1.696
DEC.	.173	.173	.254	.333	.300	.853	.840	1.077	1.311	1.333	1.026	1.013	1.331	1.644	1.636
AVG.	.174	.184	.186	.229	.284	.811	.809	.908	1.027	1.354	.985	.993	1.094	1.256	1.638

MORRIS LLOYD MINE.

LABOR
(CONTINUED)

There were no increases in wages during 1919 but the average wage rate is in excess of 1918 due to the fact that the three increases made at different times in 1918 were in effect all of 1919, which makes the 1919 average about 17% in excess of the average rate of wages for 1918 as is shown in the following statement, to which we have added previous years for comparison, - Viz:

AVERAGE WAGE RATE.

	SURFACE					UNDERGROUND					TOTAL				
	1915	1916	1917	1918	1919	1915	1916	1917	1918	1919	1915	1916	1917	1918	1919
JAN.	2.25	2.48	3.19	3.86	5.15	2.65	2.99	3.51	4.36	5.83	2.57	2.89	3.45	4.26	5.70
FEB.	2.23	2.69	2.96	3.89	5.20	2.61	3.15	3.52	4.36	5.95	2.53	3.06	3.46	4.26	5.81
MAR.	2.23	2.70	3.16	3.85	5.23	2.66	3.12	3.53	4.41	6.01	2.57	3.03	3.47	4.30	5.87
APR.	2.22	2.74	3.10	4.02	5.16	2.70	3.05	3.53	4.64	6.01	2.61	2.98	3.44	4.52	5.85
MAY.	2.23	2.91	3.40	4.22	5.19	2.63	3.16	3.88	4.86	6.02	2.64	3.12	3.80	4.74	5.84
JUN.	2.28	2.91	3.42	4.21	5.16	2.74	3.20	3.90	4.91	6.13	2.65	3.12	3.81	4.78	5.94
JUL.	2.20	2.90	3.39	4.23	5.21	2.69	3.17	3.98	4.98	6.17	2.58	3.09	3.87	4.89	5.97
AUG.	2.51	2.89	3.43	4.70	5.17	2.98	3.18	4.05	5.52	6.03	2.87	3.11	3.93	5.36	5.86
SEP.	2.46	2.88	3.44	4.82	5.20	3.03	3.17	4.16	5.53	6.10	2.91	3.12	4.00	5.39	5.92
OCT.	2.38	2.91	3.86	5.32	5.19	3.03	3.19	4.42	6.11	6.00	2.89	3.14	4.29	5.97	5.85
NOV.	2.47	2.91	3.83	5.38	5.21	3.07	3.23	4.37	6.04	5.86	2.94	3.16	4.28	5.89	5.70
DEC.	2.45	3.04	3.88	5.23	5.18	2.97	3.37	4.34	5.94	5.83	2.87	3.31	4.25	5.79	5.70
AVG.	2.33	2.83	3.44	4.48	5.18	2.83	3.17	3.93	5.14	6.00	2.72	3.10	3.84	5.01	5.84

We have accomplished a great deal more rock work this year than last which is reflected in the higher labor cost.

The following statement shows the number of men of the different nationalities at work at this mine in December month and for the same month during the previous three years, - Viz:

	1919	1918	1917	1916
Americans,	69	60	57	65
English,	14	10	13	12
Swedish,	9	9	10	13
French,	23	10	11	22
Finnish,	96	87	83	118
Italian,	53	45	51	45
Greeks,	0	2	1	3
Slavish,	3	1	0	0
TOTAL,	267	224	226	278

MORRIS LLOYD MINE.

PRODUCTION

During the year we produced a total of 282,483 tons as compared with 289,500 tons last year.

The production was made up of the following grades, - Viz:

	MINE	BESSEMER	MORRIS	SILICA	LLOYD	LLOYDDALE	TOTAL
	Morris	14,674	23,142	25,902			63,718
	Lloyd			52,853	121,623	44,289	218,765
	TOTAL, 1919	14,674	23,142	78,755	121,623	44,289	282,483
	" , 1918	30,709	16,320	41,922	141,144	59,405	289,500
	" , 1917	55,772	9,530	52,848	138,235	27,615	284,000
	" , 1916	75,024	2,630	76,350	112,119	41,562	307,685

Ore was hoisted on 299 days at the rate of 945 tons per day as compared with 297 days at 975 tons per day last year.

All of the tonnage this year was hoisted through our shafts and none was taken from the open pit except a small amount left from last year along the edges of the pit.

Our tons per man per day are lower than last year due in a measure, to the exhaustion of the cheap ore won from the open pit and the additional number of men engaged in rock work.

The following statement shows the average tons per man per day for each month of 1919 and the four previous years for comparison, - Viz:

TONS PER MAN PER DAY.

	SURFACE					UNDERGROUND					TOTAL				
	1915	1916	1917	1918	1919	1915	1916	1917	1918	1919	1915	1916	1917	1918	1919
JAN.	10.98	10.86	17.75	17.09	17.66	2.58	2.87	3.71	4.20	4.28	2.09	2.27	3.07	3.37	3.44
FEB.	10.54	12.29	18.04	16.36	18.65	2.60	2.94	3.96	4.29	4.42	2.09	2.37	3.25	3.40	3.57
MAR.	12.74	15.38	18.37	19.80	19.61	3.15	3.75	4.14	4.63	4.31	2.53	3.02	3.38	3.75	3.54
APR.	12.26	14.50	17.88	19.60	16.65	3.08	3.64	4.02	4.71	3.89	2.46	2.91	3.28	3.80	3.16
MAY.	13.91	16.50	21.43	20.84	17.68	3.20	4.17	4.33	5.25	4.57	2.60	3.33	3.60	4.20	3.63
JUN.	13.54	17.86	19.28	25.18	20.40	3.63	4.56	4.06	5.42	4.64	2.86	3.63	3.36	4.46	3.78
JUL.	14.51	15.64	20.25	24.80	17.69	4.00	4.39	4.39	5.50	4.49	3.13	3.43	3.61	4.50	3.58
AUG.	12.49	17.64	20.09	22.37	18.63	3.97	4.74	4.75	5.56	4.39	3.01	3.73	3.84	4.45	3.55
SEP.	15.15	16.04	17.36	22.96	18.70	4.06	4.53	4.79	5.61	4.81	3.20	3.53	3.75	4.51	3.83
OCT.	14.48	17.00	16.76	25.35	20.31	4.10	4.33	4.63	6.23	4.93	3.20	3.45	3.63	5.00	3.97
NOV.	15.12	15.56	16.92	15.31	16.68	3.97	4.04	4.47	4.52	4.22	3.15	3.21	3.54	3.49	3.36
DEC.	14.13	17.57	15.28	15.81	17.29	3.48	4.01	4.04	4.53	4.38	2.79	3.26	3.20	3.52	3.49
AVG.	13.38	15.57	18.51	20.45	18.33	3.48	4.00	4.29	5.04	4.44	2.76	3.18	3.48	4.04	3.57

MORRIS LLOYD MINE.

MORRIS LLOYD MINE.

SHIPMENTS

Our shipments have been the lowest in years and amounted to but 190,557 tons for the year just closed.

The following statement shows the shipments by grades for the past four years, - Viz:

	1916	1917	1918	1919	
	TONS	TONS	TONS	TONS	
Morris Bessemer,	52,275	59,620	23,785	5,000	
Lloyd Bessemer,	3,777	26,809	2,679		
TOTAL BESSEMER,	56,052	86,429	26,464	5,000	
Morris Ore,	5,433	14,050	13,576	3,613	
Lloyd Ore,	134,928	126,753	155,166	121,198	
Lloydale Ore,	31,786	19,280	60,087	27,699	
TOTAL NON BESSEMER,	172,050	160,083	228,829	152,510	
Morrisville,	389	10,930	11,878	8,506	
North Lake Silica,	111,107	45,813	48,369	24,541	
TOTAL SILICA,	111,496	56,743	60,247	33,047	
GRAND TOTAL,	339,598	303,255	315,540	190,557	

Of the total shipments for 1919, 62,374 tons were shipped from stockpile and 128,177 tons from pockets.

ORE IN STOCK

We are carrying the largest balance of ore in stock than for a great many years and we are looking forward to getting this cleaned up during the coming year.

Our balances as of December 31st are as follows, - Viz:

BALANCES IN STOCKPILES DECEMBER 31ST, 1919.

MINE	BESSEMER	MORRIS	SILICA	LLOYD	LLOYDDALE	TOTAL
Morris, Lloyd,	10,414	31,975	27,842 32,210	22,085	40,259	70,231 94,554
TOTAL, 1919	10,414	31,975	60,052	22,085	40,259	164,785
TOTAL, 1918	2,669	10,571	14,203	21,992	23,424	72,859
TOTAL, 1917	7,261	3,769	32,903	31,006	23,960	98,899
TOTAL, 1916	61,251	333	37,077	3,866	15,526	118,152

MORRIS LLOYD MINE.

COSTS OF PRODUCTION

Our Cost of Production shows an increase of approximately 18% over last year and is due to a higher wage level and also to the fact that in 1918 we mined a considerable tonnage of cheaply won ore from the open pit on Section six.

The following table shows -

PRODUCT MONTHLY, PER MAN PER DAY AND COSTS, WITH
COMPARISONS FOR PREVIOUS YEARS, TAKEN FROM
COST SHEETS.

1919	PRODUCT TONS.	TONS PER MAN PER DAY	TOTAL COST OF PRODUCTION			COST PER TON		
			LABOR	SUPPLIES	TOTAL	LABOR.	SUPP.	TOTAL
JAN.	22,947	3.44	37,319.43	13,282.10	50,601.53	1.626	.579	2.205
FEB.	21,026	3.57	32,903.13	12,751.24	45,654.37	1.564	.607	2.171
MAR.	24,560	3.54	37,948.54	15,139.52	53,088.06	1.545	.616	2.161
APR.	20,187	3.16	34,777.11	14,250.19	49,027.30	1.723	.706	2.429
MAY.	24,178	3.63	36,586.85	13,086.96	49,673.81	1.513	.541	2.054
JUN.	25,904	3.78	38,997.02	15,407.20	54,404.22	1.505	.595	2.100
JUL.	24,200	3.58	38,429.46	14,695.53	53,124.99	1.587	.608	2.195
AUG.	25,107	3.55	39,729.70	13,282.75	53,012.45	1.582	.529	2.111
SEP.	24,413	3.83	35,766.52	14,105.93	49,872.45	1.465	.578	2.043
OCT.	27,197	3.97	38,344.90	16,485.49	54,830.39	1.410	.606	2.016
NOV.	20,321	3.36	32,972.45	14,372.75	47,345.20	1.622	.707	2.329
DEC.	22,443	3.49	34,839.59	15,792.28	50,631.87	1.552	.704	2.256
ADJUSTMT				609.50	609.50			
TOTAL-19	282,483	3.57	438,614.70	173,261.44	611,876.14	1.553	.613	2.166
TOTAL-18	289,500	4.04	358,003.72	174,378.33	532,382.05	1.237	.602	1.839
TOTAL-17	284,000	*1-3.48	297,870.77	125,041.62	422,912.39	1.113	.467	1.580
TOTAL-16	307,685	*2-3.18	257,025.03	139,995.37	397,020.40	.911	.501	1.412
TOTAL-15	221,585	2.76	178,145.41	97,464.12	275,609.53	.804	.440	1.244
TOTAL-14	192,145	2.53	193,822.98	103,064.08	296,887.06	1.010	.535	1.545

*1 - 1917 Cost of Production and tons per man per day does not include 16,213 tons mined from open pit by Steam Shovel method.

*2 - 1916 Cost of Production and tons per man per day does not include 25,852 tons taken from open pit by Steam Shovel method.

MORRIS LLOYD MINE.

ESTIMATE OF PRODUCTION.

Our estimate of production for the coming year is: -

300 days at 1000 tons per day, 300,000 tons.

The following statement shows the result of development and production during the past and previous years, Viz:

Estimated Ore	1913	1914	1915	1916	1917	1918	1919
In mine Jan. 1st,	2,861,000	3,218,750	3,089,200	2,081,600	2,575,577	2,267,116	2,185,771
Product,	176,080	192,145	221,585	307,685	284,000	289,500	282,483
Balance,	2,684,920	3,026,625	2,867,615	1,773,915	2,291,577	1,977,616	1,903,288
In mine Dec. 31st,	**3,218,750	3,089,200	2,081,600	2,575,577	2,267,116	2,185,771	2,189,763
Dev. Fiscal Year,	533,830	62,575	** 786,015	801,662	** 24,461	208,155	286,475

** Shows a loss.

** 700,750 tons estimated for Morris Mine.

** Section 6 ore body reduced 603,200 tons.

OPEN PIT

Some ore was won from the East end and sides of the open pit on Section six during the summer months.

The bottom of the pit was securely covered over and slicing is now underway in this ore body.

The North and South walls of this pit have caved and the broken ground makes an excellent mat for the protection of the men working underneath.

MINE BUILDINGS

All of our mine buildings are in good condition excepting our Laboratory, this building will have to undergo some repairs to the plastering on ceilings and walls.

During the summer we renewed some of the piping in the main change house at the Morris mine.

MORRIS LLOYD MINE.

DWELLINGS

The twelve dwellings started last year have been completed as far as the contractor is concerned. The fences remain to be erected and the streets graded. This work will be accomplished the coming season.

Our houses are all in pretty fair condition but we find upon inspection that the porch floors are becoming badly decayed and also the floor joists in some cases. It would seem desirable in building houses for our men, to have a concrete wall all around the house and a concrete floor on the porches. The concrete wall in place of posts underneath the houses will assist in keeping them much warmer.

We are of the opinion that now the "booze" is being taken away from the men we will find them looking for and demanding better living conditions. It is also desirable to consider the advisability of installing bath rooms in our tenant houses.

We have eight vacant houses at the close of the year as compared with five at the end of last year, showing a gain of twenty-one families for the year.

STORE BUILDING

This building was occupied all the year by Mr. J. B. Casper who has been in it since its erection. He seems to be prospering and having a store on the location is a convenience for our people which is thoroughly appreciated.

WELFARE WORK

We continue the practice of giving prizes for Best Kept Premises etc. etc., and find this works out to the advantage of our location.

Most of our tenants take pride in keeping their places neat and clean.

MORRIS LLOYD MINE.

WELFARE WORK
(CONTINUED)

During last summer we provided land, in addition to the ground around their houses, for the purpose of raising potatoes and other vegetables and this was taken advantage of quite generally by our men. Due to the exceptionally dry season potatoes did not do very well and the crop was below the average.

The Club House has been open all the year and is of wonderful benefit to our people. Moving pictures are shown on Mondays, Wednesdays and Saturdays of each week. Bowling, Pool, Basket Ball, Indoor Base Ball and other games are going on all the time. This building is much appreciated by every one on the location.

DOCKS, TRESTLES AND POCKETS

We have been to some expense extending the Morris rock trestle, which work was done during the spring of 1919. The balance of our trestles are in good condition and very little expense has been necessary for their maintenance during the year.

On account of the small tonnage shipped from stock during the past summer we did not take down many of our stocking trestles but sliced along the sides of the piles for what ore was wanted. It will be necessary for us to erect additional bents to our present stocking trestles in order to provide room for our production until the shipping season opens next year.

TOP TRAM ENGINES AND CARS

In June month we replaced a 25 HP motor with a 50 HP on the top tram plant at the Morris mine at a cost of \$1564.00

We have been to heavy expense for repairs to motors and top tram cars for this work during the year and the total cost for maintenance runs as high as last year.

MORRIS LLOYD MINE.

TRACKS AND YARDS

The changing of the course of the Carp River where it crosses the Morris mine was the principal work under this subject during the past year.

The cost of maintaining our pocket tracks as billed us by the Lake Superior and Ishpeming Railway was \$775.86 for the year just closed and was refunded at the end of the year. This does not include the cost of work on steam shovel stockpile tracks which cost is charged direct to "Loading By Steam Shovel."

The usual amount of cleaning and ditching on surface has been necessary.

HOISTING MACHINERY

All of our hoists are in excellent condition and our expense for maintenance has not been as high as last year. Our heavy charges for the year were for new gears and pinions on the Morris mine hoists costing \$1983.00 and three new 1950 ft. ropes at this same shaft costing \$1497.56. We also added an 8' Top Shieve costing \$189.65.

PUMPS

Our expense for this account has been very low compared with last year. No new pumping machinery has been purchased and only the regular repairs to our present equipment have been necessary.

During the coming year a new pumping plant must be provided for the 7th level in the Morris mine to care for all water being made below the fourth level. This installation will discharge the water to the main pumps on the fourth level which sends it direct to surface.

We plan to install a 500 G.P.M. plunger and a 500 G.P.M. centrifugal pump for this new work.

MORRIS LLOYD MINE.

MINE VENTILATION

Natural ventilation is in force all through our mines excepting the two long rock drifts on the 6th level of the Morris mine. These drifts are provided with fans for forced draft.

ELECTRIC TRAM PLANT

We have been to heavy expense during the year in maintaining our underground haulage plant. Five locomotives and fifty cars are in work and on account of our long tramping distances the wear and tear is exceptionally heavy. The cost of cleaning tracks is also high due to spillage of wet ore from saddle back cars.

CRUSHING PLANT

The crusher at the Lloyd mine has been in operation during the whole year, both winter and summer. During the winter months shipments to Charcoal furnaces are kept up.

WATER SUPPLY

The water supply for domestic and mine purposes is pumped from the Carp River. The water from the new Barnes-Hecker mine is discharged into this stream above our intake, therefore, in order to guard our water supply and keep it clean we have been compelled to extend our suction pipe and take the water from a small creek that flows into the Carp river West of our Morris shaft.

MINE TIMBER AND LAGGING

We have had a sufficient supply of mine timber and lagging at all times during the year. The prices on this material keeps climbing which adds materially to our costs of producing a ton of ore.

MORRIS LLOYD MINE.

PERSONAL INJURIES

We are pleased to be able to report that during the year we have had no fatal or serious injuries at this mine. We have had a total of 61 accidents during the twelve months, most of them being very slight.

ACCIDENTS TO EQUIPMENT

We have had few accidents to equipment during the year. The most serious one was the Lloyd shaft in August month where the brakeman hoisted the skip too high breaking the hoisting rope and thereby letting the skip fall to the bottom of the shaft completely wrecking same.

Our motor generator set burned out on September 17th and one shift was lost while a substitution was being made.

STEAM SHOVEL LOADING

Loading by steam shovel was a slow process all through the season. The total tonnage loaded was 62,374 tons at a cost of .053 per ton. Frequent movements of the shovel were necessary which added to the cost of loading.

MORRIS LLOYD MINE.

TAXES

The valuation on the Morris Lloyd mines are lower than last year but our taxes are higher due to the larger amounts of money being raised by the different governmental divisions.

The following statement shows the valuations, taxes, cost per ton on production and shipments for the past year and for the previous three years, - Viz:

	1916		1917		1918		1919	
	VALUATION	AMOUNT	VALUATION	AMOUNT	VALUATION	AMOUNT	VALUATION	AMOUNT
LLOYD MINE.								
Realty	93460.00	2301.21	328613.00	9697.01	1139776.00	25032.19	1051450.00	28269.98
Personal	93171.00	2295.78	289291.00	8379.87	291639.00	6406.04	250524.00	6760.60
Section 6	429856.00	10584.18						
TOTAL LLOYD	616489.00	15181.17	617904.00	18076.88	1431415.00	31438.23	1301974.00	35030.58
MORRIS MINE								
Realty	75000.00	1180.94	190810.00	3108.54	327361.00	6146.86	287540.00	6736.32
Personal	60704.00	955.83	229021.00	3731.05	119322.00	2240.02	118321.00	2777.50
TOTAL MORRIS	135704.00	2137.77	419831.00	6839.59	446683.00	8386.88	405861.00	9513.82
GRAND TOTAL,	752193.00	17317.94	1037735.00	24916.47	1878098.00	39825.11	1707835.00	44544.40
PRODUCT TONS		307,685		284,000		289,500		282,483
TAXES PER								
TON PRODUCED		.056		.0877		.1376		.1577
SHPMTS TONS		339,597		303,253		315,540		190,557
TAXES PER								
TON SHIPPED		.051		.0822		.1262		.2338

ROCK DRIFTING

We are driving three rock drifts at the close of the year, one drift is going West across the Chase leases; one developing the ore in Drill Holes 57, 58 and 59 and one drift driving to the ore shown in Drill Hole No. 56.

We drifted a total of 3043 feet in rock during the past year, as compared with 442 feet in 1918.

MORRIS LLOYD MINE.

UNDERGROUND
MORRIS MINE

THIRD LEVEL:

Work has continued all the year in the two lens West of the shaft below this elevation. The product all goes to the 4th level where it is trammed to the shaft and hoisted.

The West lens is a little wet and we have had difficulty in keeping this territory supplied with men as they are unwilling to work in wet places. We close the year, however, with all contracts working with full forces and we hope to increase our production from here during the coming year. All of the ore coming from the West lens is on Chase lease No. 9.

FOURTH LEVEL:

The only work on this level during the past year was the putting up of another raise to expedite the mining of the ore above this elevation and the tramping of the product coming down from above.

SIXTH LEVEL:

During the past year considerable work has been done on this elevation. The rock drift West has been pushed clear across Chase Lease No. 24 and has now reached a point 560 feet west of the east line of the Chase Lease No. 25. This drift is now going forward on two shifts.

A rock drift has also been started from the cross-cut running South of the Morris shaft, to go East to the Lloyd territory and at the end of the year was in a distance of 965 feet. This drift will develop the ground on this elevation to the East and providing sufficient ore is found to warrant it a cross-cut will be driven to the line of the Lloyd shaft and that opening brought to this elevation. The Lloyd shaft is now bottomed 400 feet above this sixth level.

A rock drift is also being driven to develop the ore cut in Diamond Drill Holes Nos. 57, 58 and 59 on Chase Lease No. 24.

MORRIS LLOYD MINE.

UNDERGROUND
MORRIS MINE
(CONTINUED)

SIXTH LEVEL
CONTINUED

A rock drift is also being driven to reach the ore cut by Diamond Drill Hole No. 56 on Chase Lease No. 9.

Three contracts are working the ore on Chase Lease No. 24 on the 3000' line in the vicinity of Drill Hole No. 96.

Two contracts are at work in the ore underneath the hanging on Chase Lease No. 9, West lens. This ore lens extends through to above the fourth level and is being worked down from above that elevation and but little can be done down below, but we are working two gangs in order to win a larger product from this lease.

We have proven this lens of ore to run through to the fourth level. A sub was driven South on the 677 elevation which shows 80 feet of ore.

Some exploring was also done during the year in the East ore lens and the downward extension of the ore on the fourth level practically determined. Nothing is now being done in this ore body below the 4th level. We are of the opinion that the ore found in Drill Hole No. 56 is the same ore as is carried in this East lens from above.

SINKING MORRIS SHAFT

During the year the Morris shaft was sunk a distance of 250 feet and has now reached a depth of 1450 feet from surface. This bottom is 250 feet below our present working level the 6th, 1250 ft. elevation.

The 12" pipe for the counter-weight is on hand and the pocket timbers are now being framed for the new level. As soon as this work has been completed the skips and cage will be sent to this level and crosscutting to the ore measures will be placed underway.

MORRIS LLOYD MINE.

UNDERGROUND
MORRIS MINE

DIAMOND DRILLING

Hole No. 48 was put down 328' vertically on Chase Lease No. 24 and 20 feet of ore cut at 80 to 100 feet.

Hole No. 56 was drilled Southwest from main level on Chase Lease No. 9 about 60 feet West of the East line of this lease and after passing through mixed material shows good ore from 205' to 310' and more or less good ore from 340' to 415'.

Holes 57, 58 and 59 were drilled horizontally South and Southwest from the main footwall drift on Chase Lease No. 24. All of these holes cut a few feet of ore.

Hole No. 61 was drilled horizontally South from the footwall drift on Chase lease No. 25 and showed no ore.

Hole No. 60 was drilled on Company land from the footwall drift going East towards the Lloyd mine and drilled South horizontally to determine the contact of the footwall and ore measures. The hole went out of the footwall slates and into jasper at 250 feet and continued in same to 417 feet without finding any ore.

The drill was moved back on Hole No. 41 on the 6th level Morris mine and the hole continued to a total depth of 1640 feet without finding any ore.

A more extended report on this diamond drilling will be submitted by the Geological Department.

LLOYD MINE

SECOND LEVEL

Work was discontinued on this elevation during the year and nothing is now being done on this elevation.

MORRIS LLOYD MINE.

LLOYD MINE

THIRD LEVEL

Nine gangs of miners have been engaged in slicing and caving above this main level all through the year and a good product has been received. The territory is dry and we experience no difficulty in keeping men at work here.

In November month we encountered a nice body of good ore on the 1050' sub. We expect this is the ore encountered in Diamond Drill Hole No. 18 which was put down from surface and which could not be located underground. This ore body is now 110 feet long and 30 feet wide and should run up above the second level.

A short Diamond Drill Hole No. 53 was drilled horizontally to the footwall on the 1065' sub level. This was to endeavor to locate the ore shown in vertical Hole No. 18, which ore was encountered on the 1050' sub as reported above.

FOURTH LEVEL

One gang of miners has been at work in the ore underneath the hanging above this level. This ore body is the continuation of the ore which outcropped at surface and which was worked last year from the open pit. Not much ore can be taken from this elevation until it has been worked down from above.

Nothing is now being done in this territory on account of labor shortage and the men have been taken to the Chase leases in the Morris mine.

MORRIS LLOYD MINE.

SECTION SIX
(LLOYD EAST)

FIRST SUB (1455')

We are working the top of the main ore body from above this elevation and have ten gangs of miners in the territory underneath the open pit and West of the pit underneath the hanging. This is the part of the mine from which we are getting our largest production per man. The ore is of good iron content but somewhat high in phosphorus in places.

The main drift on this sub is being extended West along the dike and is still in ore which shows a larger area on this elevation than at first supposed.

Diamond Drill Holes Nos. 49 and 50 were drilled horizontally on this elevation South of the shaft. No. 50 shows good ore 90 feet to 130 feet and a raise has now been brought up from the second main sub to reach this ore. The raise has reached the elevation of this 1st main sub and the men are now drifting East to hole from the top of the raise to the level in order to provide an out-let for men and supplies. This ore will extend some distance above this main sub.

SECOND SUB (1305')

No. 10 contract have been at work most of the year in a shrinkage stope West of Section Six shaft and have followed and stoped the ore up above the elevation of old No. 8 stope to the East. These two ore bodies were separated by only a thin band of jasper.

MORRIS LLOYD MINE.

UNDERGROUND
SECTION SIX

SECOND SUB (1305')
CONTINUED-

A drift was driven to the top of the raise coming up from the 3rd sub and the ore trammed to the main raise to the main 3rd haulage level. The ore in this territory was found to extend upwards farther to the East and raise No. 17 is now being extended and brought up into this territory from the main 3rd haulage level.

No. 12 has drifted West below the elevation and have now raised to reach the ore found in Drill Hole No. 49 on the first sub. They are now in ore and are drifting on the elevation of the first main sub. This raise passed through 70 feet of rock prior to reaching the ore.

FOURTH SUB

No. 42 continued slicing and caving all the year in their small ore body. They are now getting down close to the main 3rd level and their place will not last much longer. This ore lies between dikes and is very high in phosphorus at times, and it is difficult to keep it clean from the caving dike material.

MORRIS LLOYD MINE.

ORE IN SIGHT DECEMBER 31ST, 1919

Following is an estimate of ore in the mine as of December 31st, 1919, calculating a deduction of 20% for rock and loss in mining, - Viz:

MORRIS MINE

LOCATION OF ORE	BESSEMER	MORRIS ORE	TOTAL
Above 4th Lev. (Chase Lease #9)		52,720	52,720
" " " (C.C.I.Co. Land)		103,454	103,454
" 6th " (Chase Lease #9)		164,803	164,803
" " " (Chase Lease #24)		14,429	14,429
" " " (C.C.I.Co. Land)		81,971	81,971
PROSPECTIVE ORE.			
Shown by Drill Hole No. 36			
Below 6th Level (C.C.I.Co.)		72,534	72,534
Shown by Drill Holes Nos. 29, 32 and 34, below 6th level, (C.C.I.Co.)		28,534	28,534
Ore above 4th Level (C.C.I.Co.)		2,083	2,083
PROSPECTIVE, (CHASE LEASE #9)			
Above 6th Level,		2,408	2,408
Below 6th " (Contract #28)		6,520	6,520
" " " Shown by #36 D.D.H.		21,334	21,334
6th " Shown by #56 D.D.H.		21,599	21,599
PROSPECTIVE, (CHASE LEASE #24)			
Below 6th Level (Shown by D.D.Holes #42,43,44,45 UNdg. & #4 Surface		41,083	41,083
Shown by Drill Holes #46 & 47.		12,302	12,302
Shown by Drill Holes #57, 58 & 59.		7,198	7,198
Floor of 6th Level,		1,389	1,389
TOTAL ORE, MORRIS MINE.		634,361	634,361

LLOYD MINE

LOCATION OF ORE	LLOYD ORE	LLOYDDALE	TOTAL
Above 3rd Level,	123,868	90,841	214,709
PROSPECTIVE ORE.			
Below 3rd Level,		6,111	6,111
TOTAL ORE, LLOYD MINE.	123,868	96,952	220,820

MORRIS LLOYD MINE.

ORE IN SIGHT DECEMBER 31ST, 1919.
(CONTINUED)

LLOYD EAST

LOCATION OF ORE	LLOYD ORE	LLOYDDALE	TOTAL
Above 1455' Sub Level	46,687	15,564	62,251
" 1305' " "		252,538	252,538
" 1155' " "	43,329	176,465	219,794
" 1055' " "	10,755	70,012	80,767
" 3rd Level	33,406	124,492	157,898
" 4th "	111,486	329,354	440,840
PROSPECTIVE ORE			
Above 1055' Sub Level	1,500	3,500	5,000
" 4th Level	2,208	5,152	7,360
Below 4th "		100,834	100,834
D.D.Hole #50 on 1455' Sub	1,309	3,927	5,236
Above 1290' Sub,#12 Contract	1,032	1,032	2,064
TOTAL LLOYD EAST,	251,712	1,082,870	1,334,582

SUMMARY OF TOTAL ORE

MINE	BESSEMER	LLOYD & MORRIS	LLOYDDALE	TOTAL
Morris,		634,361		634,361
Lloyd,		123,868	96,952	220,820
Lloyd East,		251,712	1,082,870	1,334,582
GRAND TOTAL,		1,009,941	1,179,822	2,189,763

	MORRIS MINE		LLOYD MINE		TOTAL	GRAND TOTAL
	MORRIS ORE	LLOYD ORE	LLOYDDALE	LLOYD MINE		
Total ore developed	417,377	369,531	1,059,266	1,428,797	1,846,174	
" Prospective Ore	216,984	6,049	120,556	126,605	343,589	
TOTAL,	634,361	375,580	1,179,822	1,555,402	2,189,763	

Total ore on Chase Lease No. 9 269,384
 " " " " " " 24 76,401
 " " " Company Lands, 1,843,978
 GRAND TOTAL, 2,189,763

NORTH LAKE DISTRICT

TONNAGES MINED AND TONNAGES ACCRUED ON LEASES.

The following statement shows the condition of our Royalties on the different leases now in force in the North Lake District, Viz:

YEAR	LEASE NO. 9			LEASE NO. 24			LEASE NO. 31		
	ACCRUED	MINED	BALANCE	ACCRUED	MINED	BALANCE	ACCRUED	MINED	BALANCE
1908	2,283								
1909	10,000			1,088					
1910	10,000			15,000					
1911	10,000			15,000			70,000		
1912	10,000	968		15,000			70,000		
1913	10,000	15,345		15,000			70,000		
1914	10,000	36,267		15,000			70,000		
1915	10,000	67,740		15,000			17,500		
1916	10,000	68,524		15,000			17,500		
1917	10,000	34,514		15,000	2,569		70,000		
1918	10,000	24,002	145,077	15,000	288	133,231	35,000		420,000
1919	10,000	32,176	177,253	15,000	4,465	143,766	70,000		490,000

YEAR	LEASE NO. 25			LEASE NO. 26			LEASE NO. 27		
	ACCRUED	MINED	BALANCE	ACCRUED	MINED	BALANCE	ACCRUED	MINED	BALANCE
1909	1,088			1,088			1,088		
1910	15,000			15,000			15,000		
1911	15,000			15,000			15,000		
1912	15,000			15,000			15,000		
1913	15,000			15,000			15,000		
1914	15,000			15,000			15,000		
1915	15,000			15,000			3,750		
1916	15,000			15,000			3,750		
1917	15,000			15,000			15,000		
1918	15,000		136,088	7,500		128,588	7,500		106,088
1919	15,000		151,000	13,125		141,713	13,125		119,213

YEAR	LEASE NO. 28			GRAND TOTAL		
	ACCRUED	MINED	BALANCE	ACCRUED	MINED	BALANCE
1909	545					
1910	7,500					
1911	7,500					
1912	7,500					
1913	7,500					
1914	7,500					
1915	1,875					
1916	1,875					
1917	7,500					
1918	3,750		53,045	1,082,180	250,217	831,963
1919	6,563		59,608	1,224,973	286,858	938,135

BARNES HECKER MINE.

MINE BUILDINGS

These buildings were completed last year, with the exception of putting in the concrete floor in the Engine House. We placed this floor during May month and the building is now complete.

DWELLINGS

All of our tenant houses have been occupied at all times and we could use a number of additional houses right now.

The fences and grading of roadway on this location have not yet been completed on account of shortage of labor. We hope to finish up this work during the coming season.

LABOR

We have been short of men all the year at this property and find it particularly difficult to get trammers.

STOCKING TRESTLE

A permanent "one leg" stocking trestle has been erected South of the railway tracks, East of the shaft. The rock from the drifts underground will be dumped on the ground and spread underneath this trestle to form a stocking floor for the ore, in place of lumber. This trestle is built of wood and is constructed with but a single leg and guyed with wire rope on each side. This method of construction will permit us to remove the ore with steam shovel without dismantling the trestle and will also place us in position to stock our production at any and all times. The saving each year over the temporary style of trestle will amount to a considerable sum. There is no question about this working out satisfactorily as we erected a like structure at the Republic mine four years ago and it is still doing duty.

BARNES HECKER MINE.

HOISTING MACHINERY

Both the skip and cage hoists have been installed and are at work.

UNDERGROUND HAULAGE PLANT

The convertor for this work has been installed.

While putting down the cable in the shaft the electrician let it fall away and wrecked most of it in the shaft. We have patched this up to use until we can get a new cable and expect to get our locomotives operating underground during the coming month of January.

TOP TRAM ENGINE

This equipment was placed in December month and as soon as the rollers and shieves have been placed on the new trestle, will be put in operation.

SINKING SHAFT

At the beginning of the year this shaft had reached a point 624 feet from surface and 24 feet below the first level. The first level plat and pocket had been cut.

During the first eight months of the year the shaft was bottomed at 1067 feet from surface and the second level and pocket cut at 800 feet and the 3rd level plat and pocket cut at the 1000 foot elevation from surface. The shaft has been concreted the entire distance and is in first class condition.

The runners for both skips and cage were placed and this equipment is now in use.

DRIFTING

Drifting on all three levels is now underway but only the second level has made much progress thus far due to a shortage of men.

BARNES HECKER MINE.

DRIFTING
(CONTINUED)

We have an Armstrong underground loader at work on the second level and fair progress is being made. During December month this drift was driven an average of $15\frac{1}{2}$ feet per day. It has now reached a point 505 feet from the shaft.

We have two additional Armstrong shovels coming for the first and third levels and as soon as these are placed in work better progress can be made on these levels.

ROTARY DUMP

The Wood Pneumatic Rotary Car Dumpers have been installed on all three levels and are now in work and giving satisfactory service.

The cars used with this dump are of solid box construction and prevent spillage of ore along the tracks which in itself is a large saving over the old style saddle back cars.

There is also a saving of approximately \$300 on each of these solid box cars as compared with the cost of saddle back cars.

PUMP HOUSE

The pump house on the 3rd level is now being cut. The plunger pump is on the ground and will be installed as soon as the room is ready.

The 8" water column has been installed in the shaft and ready for use.

One, 150 G.P.M. belt driven electric pump has been temporarily installed on the second level to care for the small amount of water being made at present.

It will be necessary to have our main pump ready for work on the bottom prior to breaking through to the ore measures.

BARNES HECKER MINE

ACCIDENTS

This shaft was sunk and bottomed without a single serious accident, but while the plates were being placed in the pocket on the second level, Einar Salminen, our timber foreman in some manner fell from the ladder, on which he was working, into the pocket and through same into and down to the bottom of the shaft, a distance of 260 feet and was instantly killed.

This accident could have been avoided if the proper precautions had been taken by him to block the mouth of the pocket.

Salminen was our very best workman, very competent and conscientious and we find it practically impossible to fill his place.

MORRIS LLOYD MINE.

ANALYSIS OF COST SHEETS, EXPLAINING INCREASE OR DECREASE IN VARIOUS ACCOUNTS BETWEEN YEARS 1919 - 1918.

GENERAL EXPENSE

Insurance, <u>Acct. 26,</u>	Year 1919,	\$1403.65	Cost per Ton	.005
	Year 1918,	<u>685.03</u>	" " "	<u>.002</u>
	Increase 1919,	718.62	"	.003

This increase is mainly for Riot Insurance premium paid during 1919.

Personal Injuries, <u>Acct. 30,</u>	Year 1919,	\$6386.46	Cost per Ton	.023
	Year 1918,	<u>4107.10</u>	"	<u>.014</u>
	Increase 1919,	2279.36	"	.009

This increase for 1919 is due entirely to increased charge account Ishpeming Hospital, the amount for 1919 being \$3629.64 as compared with \$864.94 in 1918.

Office, <u>Acct. a&b</u>	Year 1919,	\$19063.80	Cost per Ton	.067
	Year 1918,	<u>16336.73</u>	"	<u>.057</u>
	Increase 1919,	2727.07	"	.010

This increase is due to increase in salaries over 1918. While no increases were made in 1919, the three increases, made at different times in 1918 were in force all of 1919. There is also a charge this year of \$1200.62 to take care of expenditures at the North Lake Club House which were incurred over and above amount received.

SUMMARY GENERAL EXPENSE

Year 1919,	\$36460.05	Cost per Ton	.129
Year 1918,	<u>30648.09</u>	"	<u>.106</u>
Increase 1919,	5811.96	"	.023

MAINTENANCE

Tracks & Yards, <u>Acct. 125,</u>	Year 1919,	\$2783.19	Cost per Ton	.010
	Year 1918,	<u>2193.41</u>	"	<u>.008</u>
	Increase 1919,	589.78	"	.002

The increase this year was due to changing the course of the Carp River as noted in Annual Report.

MORRIS LLOYD MINE.

MAINTENANCE
(CONTINUED)

Docks, Trestles
and Pockets,

<u>Acct. 126,</u>	Year 1919,	\$1320.57	Cost per Ton	.005
	Year 1918,	<u>408.17</u>	"	<u>.001</u>
	Increase 1919,	912.40	"	.004

The increase in 1919 is due to extending the rock trestle at the Morris mine and extensive renewals of plates in the pockets in the shaft houses.

Buildings,

<u>Acct. 127,</u>	Year 1919,	\$512.37	Cost per Ton	.002
	Year 1918,	<u>420.81</u>	"	<u>.002</u>
	Increase 1919,	91.56	"	- -

The repairs to buildings was about the same as last year and the increase is about the normal increase in wages for labor employed.

Shop Machinery,

<u>Acct. 128,</u>	Year 1919,	\$2217.84	Cost per Ton	.008
	Year 1918,	<u>277.73</u>	"	<u>.001</u>
	Increase 1919,	1940.11	"	.007

The increase this year is due to installing a new pipe machine in our shop.

Boiler Plant,

<u>Acct. 129,</u>	Year 1919,	\$277.31	Cost per Ton	.001
	Year 1918,	<u>144.78</u>	"	<u>.001</u>
	Increase 1919,	132.53	"	- -

The increase this year is due to additional repairs to heating boilers in dry buildings and crusher plant.

Hoisting Machinery,

<u>Acct. 130,</u>	Year 1919,	\$6226.02	Cost per Ton	.022
	Year 1918,	<u>7297.41</u>	"	<u>.025</u>
	Decrease 1919,	1071.39	"	.003

The decrease in 1919 is accounted for by the fact that in 1918 we had to renew a larger amount of hoisting ropes due to the deepening of the Morris shaft.

Compressors &
Power Drills,

<u>Acct. 131,</u>	Year 1919,	\$2348.06	Cost per Ton	.008
	Year 1918,	<u>50.09</u>	"	<u>.000</u>
	Increase 1919,	2297.97	"	.008

The increase in 1919 is due to the purchase of 8 D.P. 33 Sinking and 2 #248 Ingersol Leyner Drill Machines.

MORRIS LLOYD MINE.

MAINTENANCE
(CONTINUED)

Pumping Machinery, <u>Acct. 132,</u>	Year 1919,	\$2189.94	Cost per Ton	.008
	Year 1918,	<u>8789.90</u>	"	<u>.030</u>
	Decrease 1919,	5600.96	"	.022

The decrease in 1919 is accounted for by the small expenditures for additional pumping capacity, whereas, in 1918 we had to provide a pump house and install pumps in the 6th level of the Morris mine.

Top Tram Eng. and Cars, <u>Acct. 133,</u>	Year 1919,	\$4335.03	Cost per Ton	.015
	Year 1918,	<u>4389.24</u>	"	<u>.015</u>
	Decrease 1919,	54.21	"	- -

The chief item of expense to this account during 1919 was the installing of a new 50 HP motor at the Morris landing. The regular maintenance charges are about the same as last year.

Skips and Skip Roads, <u>Acct. 134,</u>	Year 1919,	\$1710.61	Cost per Ton	.006
	Year 1918,	<u>1404.80</u>	"	<u>.005</u>
	Increase 1919,	305.81	"	.001

Increase in wage rate and additional repairs account for the increase this year over last.

Undg. Tracks and Cars, <u>Acct. 135,</u>	Year 1919,	\$2132.30	Cost per Ton	.007
	Year 1918,	<u>2381.26</u>	"	<u>.008</u>
	Decrease 1919,	248.96	"	.001

The decrease this year is due to less sub-level rail and repairs to cars as compared with last year.

Electric Tram Plant, <u>Acct. 136,</u>	Year 1919,	\$16134.10	Cost per Ton	.057
	Year 1918,	<u>10079.82</u>	"	<u>.035</u>
	Increase 1919,	6054.28	"	.022

We have been to heavy expense on our underground locomotives and cars during the present year. Have had a large number of broken wheels due to faulty material. Our rewiring of armatures has also been a heavy expense.

On account of the large footage of main haulage drifts driven during the year to charge to tracks has also been heavy.

MORRIS LLOYD MINE.

MAINTENANCE
(CONTINUED)

Tel. & Safety
Devices,

<u>Acct. 137,</u>	Year 1919,	\$757.83	Cost per Ton	.003
	Year 1918,	<u>974.53</u>	"	<u>.003</u>
	Decrease 1919,	216.70	"	- -

We have found it necessary to expend a smaller amount for safety work during the current year than last which accounts for the decrease this year.

SUMMARY OF MAINTENANCE EXPENSE

Year 1919,	\$43045.17	Cost per Ton	.152
Year 1918,	<u>38812.61</u>	"	<u>.134</u>
	4232.56	"	.018

MINING EXPENSE

Air Pipes,
Acct. 150,

Year 1919,	\$3858.87	Cost per Ton	.014
Year 1918,	<u>2303.71</u>	"	<u>.008</u>
Increase 1919,	1555.16	"	.006

Increase in wage rate and additional piping in long rock drifts we are now driving accounts for the increase over 1918.

Compressors,
Acct. 151,

Year 1919,	\$26338.80	Cost per Ton	.093
Year 1918,	<u>25595.25</u>	"	<u>.088</u>
Increase 1919,	743.55	"	.005

Increase in wage rate and additional air consumption due to increased rock drifting accounts for increase this year.

Hoisting,
Acct. 152,

Year 1919,	\$22953.74	Cost per Ton	.081
Year 1918,	<u>20798.22</u>	"	<u>.072</u>
	2155.52	"	.009

Increased electric power on account hoisting additional amount rock from lower elevation accounts for increase this year.

MORRIS LLOYD MINE.

MINING EXPENSE
(CONTINUED)

Pumping, <u>Acct. 153,</u>	Year 1919,	\$21121.06	Cost per Ton	.075
	Year 1918,	<u>21249.00</u>	"	<u>.073</u>
	Decrease 1919,	127.94		.002

Decrease this year is due to less labor cleaning sumps.

Sinking & Shaft Repairs, <u>Acct. 154,</u>	Year 1919,	\$29261.92	Cost per Ton	.104
	Year 1918,	<u>21139.06</u>	"	<u>.073</u>
	Increase 1919,	8122.86	"	.031

Increase in 1919 is due to increase wage scale and sinking Morris shaft an additional lift of 250 feet.

Rock Drifting, <u>Acct. 155,</u>	Year 1919,	\$16953.77	Cost per Ton	.060
	Year 1918,	<u>5323.08</u>	"	<u>.019</u>
	Increase 1919,	11630.69	"	.041

The increase in 1919 is due to additional rock drifting this year over 1918. We drifted 1397 feet this year as compared with 442 feet last year. We also drifted an additional 1646 feet in rock this year the expense of which is charged to Acct. 177 Extraordinary Drifting.

Breaking Ore, <u>Acct. 156,</u>	Year 1919,	\$228267.10	Cost per Ton	.608
	Year 1918,	<u>190938.42</u>	"	<u>.660</u>
	Increase 1919,	37328.68	"	.128

In 1918 we milled a quantity of ore from the open pit which was won at a comparative low cost, this kept the cost per ton down for 1918. In 1919 a small quantity of ore was taken from this open pit area. The increase in wage scale also operates to increase the cost this year over last.

Tramming, <u>Acct. 157,</u>	Year 1919,	\$59607.93	Cost per Ton	.211
	Year 1918,	<u>48660.44</u>	"	<u>.168</u>
	Increase 1919,	10947.49	"	.043

The increase wage scale accounts for the increase in tramming costs over last year.

MORRIS LLOYD MINE.

MINING EXPENSE
(CONTINUED)

Timbering, <u>Acct. 159.</u>	Year 1919,	\$81988.32	Cost per Ton	.290
	Year 1918,	<u>76374.01</u>	"	<u>.264</u>
	Increase 1919,	5614.31		.026

Increased wage scale and increase in price paid for mine timber accounts for the high cost this year.

The cost last year was lower, also, due to the tonnage taken from the open pit, which was taken out without timber.

Mine Captains and Bosses, <u>Acct. 160.</u>	Year 1919,	\$20367.99	Cost per Ton	.072
	Year 1918,	<u>17938.30</u>	"	<u>.062</u>
	Increase 1919,	2429.69	"	.010

The increase in wage scale accounts for the increase in this expense over last year. We employ the same number of bosses.

Dry House, <u>Acct. 161.</u>	Year 1919,	\$9999.41	Cost per Ton	.036
	Year 1918,	<u>8511.45</u>	"	<u>.029</u>
	Increase 1919,	1487.96	"	.007

Increase in wage scale and the higher price of coal accounts for the higher costs in this account for the current year.

Top Landing & Tramming, <u>Acct. 162.</u>	Year 1919,	\$10138.87	Cost per Ton	.036
	Year 1918,	<u>7649.80</u>	"	<u>.027</u>
	Increase 1919,	2489.07	"	.009

Wage increase and additional ore stocked and rock trammed accounts for increase in this account over last year.

Stocking Ore, <u>Acct. 163.</u>	Year 1919,	\$1503.14	Cost per Ton	.005
	Year 1918,	<u>2108.19</u>	"	<u>.007</u>
	Decrease 1919,	605.05	"	.002

The decrease this year is due to less trestle work on account of small shipments from stockpile. We sliced along the side of the piles in most cases in shipping the requirements.

We will have additional charges to this account during the present stocking season as we will not have room on our present stocking trestles.

MORRIS MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR 1919.

GRADE	IRON	PHOS.	SILICA
Morris Bessemer,	59.97	.050	7.16
Morris,	58.25	.072	8.40
Morrisville,	52.81	.061	16.57

Above grades went into mixed cargoes.

ORE STATEMENT - DECEMBER 31ST, 1919.

	MORRIS BESSEMER	MORRIS	MORRISVILLE	TOTAL	TOTAL LAST YEAR
On hand Jan. 1st, 1919,	2,669	10,571	10,446	23,686	27,724
Output for year,	12,745	25,017	25,902	63,664	48,248
Stockpile Overrun,					
Total,	15,414	35,588	36,348	87,350	75,972
Shipments,	5,000	3,613	8,506	17,119	52,286
Balance on hand,	10,414	31,975	27,842	70,231	23,686
Increase in output-14%				6,910	
Increase in ore on hand,				46,545	

1919 - 2-8 Hour Shifts

1918 - 2-8 Hour Shifts

MORRIS MINE

SHIPMENTS FOR YEAR -- 1919.

GRADE	POCKET	STOCKPILE	TOTAL	TOTAL LAST YEAR
Morris Bessemer,	5,000		5,000	23,785
Morris,	3,613		3,613	13,576
Morrisville,	37	8,469	8,506	14,925
Total,	8,650	8,469	17,119	52,286
Total last Year,	20,894	31,392	52,286	
Decrease - 67%			35,167	

MORRIS MINE.

LLOYD MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR 1919.

GRADE	IRON	PHOS.	SILICA
Lloyd,	58.88	.092	6.79
Lloyddale,	58.66	.149	6.25
North Lake Silica,	52.00	.076	16.74

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR 1919.

GRADE	Mine			Lake Erie	
	IRON	PHOS.	SILICA	IRON	MOIST.
Lloyd,	59.16	.083		59.01	11.42
North Lake Silica,	52.29	.068	18.20		

This Silica Ore was consigned to Lake Michigan
Ports for Charcoal Furnaces.

ORE STATEMENT - DECEMBER 31ST, 1919.

	LLOYD BESSEMER	LLOYD	LLOYD SILICA	LLOYDDALE	TOTAL	TOTAL LAST YEAR
On hand Jan. 1st, 1919,	0	21992	3757	23424	49173	71175
Output for year,	0	121291	52994	44534	218819	241252
Total,	0	143283	56751	67958	267992	312427
Shipments,	0	121198	24541	27699	173438	263254
Balance on hand,		22085	32210	40259	94554	49173
Decrease in output-6%					13927	
Increase in ore on hand,					45361	

1919 - 2-8 Hour Shifts
1918 - 2-8 Hour Shifts

LLOYD MINE.

LLOYD MINE

SHIPMENTS FOR YEAR 1919.

GRADE	POCKET	STOCKPILE	TOTAL	TOTAL LAST YEAR
Lloyd Bessemer,				2,679
Lloyd,	79,196	42,002	121,198	155,166
Lloyd Silica,	24,541		24,541	45,322
Lloyddale,	15,795	11,904	27,699	60,087
Total,	119,532	53,906	173,438	263,254
Total last Year,	177,519	85,735	263,254	
Decrease - 34%			89,816	

MORRIS-LLOYD MINE.

COMPARATIVE MINING COST FOR YEAR.

	1 9 1 9.	1 9 1 8.	INCREASE.	DECREASE.
PRODUCT	282,483	289,500		7,017
General Expense	.129	.106	.023	
Maintenance	.152	.134	.018	
Mining Expense	1.835	1.599	.236	
Cost of Production	2.166	1.839	.327	
Exploratory	.149	.034	.115	
DEPRECIATION.				
Original Purchase	.053	.056		.003
Plant Account	.260	.251	.009	
Equipment	-	.001		.001
Uncompleted Construction	-	.008		.008
Total Depreciation	.313	.316		.003
Taxes	.158	.138	.020	
Central Office	.069	.072		.003
Supply Inventory	.001	.011		.010
Miscellaneous	.014	.015		.001
Sundry Expense	.007	.030		.023
Cost on Stockpile	2.877	2.455	.422	
Loading and Shipping	.049	.083		.034
Total Cost on Cars	2.926	2.538	.388	
No. Days Operating	299	297	2	
No. Shifts and Hours	2-8hr	2-8hr		
Avg. Daily Product	945	975		30
COST OF PRODUCTION.				
Labor	1.553	1.247	.306	
Supplies	.613	.592	.021	
Total	2.166	1.839	.327	

MORRIS-LLOYD MINE.

COMPARATIVE WAGES AND PRODUCT.

	1919.	1918.	INCREASE.	DECREASE.
PRODUCT	282,383	289,500		7,017
No. Shifts and Hours	2-8hr	2-8hr		
AVERAGE NUMBER MEN WORKING				
Surface	48	45	3	
Underground	212	191	21	
Total	260	236	24	
AVERAGE WAGES PER DAY				
Surface	5.18	4.51	.67-14.8%	
Underground	6.00	5.10	.90-17.6%	
Total	5.84	4.99	.75-15%	
WAGES PER MONTH OF 25 DAYS				
Surface	129.50	102.75	25.75	
Underground	150.00	127.50	22.50	
Total	146.00	124.75	21.25	
PRODUCT PER MAN PER DAY				
Surface	18.30	20.41		2.11
Underground	4.45	5.05		.60
Total	3.58	4.05		.47
LABOR COST PER TON				
Surface	.283	.221	.062	
Underground	1.349	1.010	.339	
Total	1.632	1.231	.401	
AVG. PRODUCT BRK'G & TRM'G	6.82	7.77		.95
" WAGES CONTRACT MINERS	6.52	5.84	1.18	
" " " TRAMMERS	0	0		
" " " LABOR	6.52	5.34	1.18	
TOTAL NUMBER OF DAYS				
Surface	15,439 $\frac{1}{2}$	14,184 $\frac{1}{4}$	1,255 $\frac{1}{2}$	
Underground	63,544 $\frac{1}{2}$	57,289 $\frac{1}{2}$	6,254 $\frac{1}{2}$	
Total	78,983 $\frac{1}{2}$	71,473 $\frac{1}{2}$	7,510	
AMOUNT FOR LABOR				
Surface	79955.37	63968.82	15986.55	
Underground	381026.08	292494.86	88531.22	
Total	460981.45	356463.68	104517.77	

Proportion Surface to Underground Men;

1919 - 1 to 4.44
 1918 - 1 to 4.24
 1917 - 1 to 4.57
 1916 - 1 to 3.93
 1915 - 1 to 3.85
 1914 - 1 to 4.48

MORRIS-LLOYD MINE.

TIMBER STATEMENT FOR YEAR ENDING DECEMBER 31, 1919.

KIND.	LINEAL FEET.	AVG.PRICE PER FOOT.	AMOUNT 1 9 1 9.	AMOUNT 1 9 1 8.
6" to 8" Timber	75,935	.032	2435.88	5152.48
8" to 10" "	57,660	.078	4501.94	2593.13
10" to 12" "	16,884	.122	2062.84	1737.33
12" to 14" "	1,314	.139	183.12	358.48
Total - 1919	151,793	.061	9183.78	
Total - 1918	240,204	.041		9841.42
	LINEAL FEET.	PER 100'.		
5' Lagging	656,200	.636	4171.17	1796.32
7' "				110.00
8' "	403,334	.807	3253.65	3597.19
Total Lagging	1,059,534	.701	7424.82	5403.51
Poles	49,760	1.24	619.33	431.49
Total - 1919	1,109,294	.725	8044.15	
Total - 1918	900,569	.647		5835.00
Product			282,483	289,500
Feet Timber per ton of ore			.535	.83
Feet Lagging "			3.75	2.95
Feet Lagging per ft. of Timber			6.98	3.56
Cost per ton for Timber			.0325	.034
" Lagging			.0263	.019
" Poles			.002	.001
" Timber, Lagging & Poles			.0608	.054
Equivalent of still timber to Bd.Measure			214,880	373,884
Ft.Bd.Measure per ton of ore			.76	1.29

Total Cost for Timber, Lagging & Poles - 1919	17187.93
" 1918	15676.42
" 1917	19623.30
" 1916	20682.74
" 1915	14219.21
" 1914	12335.11
" 1913	8394.16
" 1912	6634.06
" 1911	6001.30

Increase in cost per ton is due to increase in price of timber.

MORRIS-LLOYD MINE.

STATEMENT OF EXPLOSIVES USED FOR BREAKING ORE.

KIND.	QUANTITY.	AVERAGE PRICE.	AMOUNT 1 9 1 9.	AMOUNT 1 9 1 8.
40% Powder	148,130	16.65	24666.79	25599.15
60% "	1,600	20.43	326.85	1186.22
Total Powder	149,730	16.69	24993.64	26785.37
Fuse,	406,850	8.29	3372.33	2544.81
Caps,	84,200	14.16	1192.72	1003.25
Cap Crimpers,	21	.39½	8.30	20.67
Tamping Bags,	24,000	1.74	41.80	59.52
Total Fuse,			4615.05	3623.25
Total Explosives,			29608.69	30413.62
Product			282,483	289,500
Pounds Powder per ton of Ore			.53	.496
Cost per ton for Powder			.0885	.0925
" Fuse, Caps, Etc.			.0163	.0125
" All Explosives			.1048	.105
Avg. Price per Lb. for Powder			.1169	.187

Mr. M. M. Duncan, Vice-Pres. & Gen. Mgr.,
Ishpeming, Michigan.

Dear Sir:

I beg to submit the following report of the work done in the
Gwinn District for the year ending December 31st, 1919.

The various subjects have been taken up under the following heads:

GENERAL REMARKS

AUSTIN MINE

STEPHENSON MINE

PRINCETON MINE

GWINN MINE

JOPLING MINE

FRANCIS MINE

GARDNER AND MACKINAW MINES

GENERAL SURFACE

ANALYSIS OF COST SHEETS

ANALYSIS OF NEW CONSTRUCTION

- - -

The product of the several producing mines for the year was as follows:

PRINCETON MINE,	193,228	tons
GWINN "	137,847	"
FRANCIS "	80,528	"
GARDNER "	19,158	"
MACKINAW "	50,168	"
AUSTIN "	14,896	"
STEPHENSON "	<u>2,402</u>	"
TOTAL,	498,227	"
Total Product for 1918,	<u>347,688</u>	"
INCREASE,	150,539	"

The Princeton and Gwinn Mines produced two-thirds of the ore mined in the district in 1919. The product from the Francis Mine is practically double that of the previous year, and there has been some product also from both the Mackinaw and Gardner Mines, which went on an operating basis July 1st, 1919.

Development work was continued throughout the year at the Jopling Mine, and some ore was developed on the 543' and 573' sub-levels. This ore, however, was so close to surface, and there was so much water coming in, that it was not considered that it was available for mining. At the close of the year preparations were being made for diamond drilling on the Jopling property, to explore a stretch of ground 918 feet below surface, in which there had never been any diamond drilling done. The work of unwatering the Stephenson and Austin Mines was continued throughout part of the year. The Austin Mine was unwatered early in August, and the Stephenson Mine in October. The work of re-opening the Austin has been completed and this mine operated practically at capacity during the month of December. Work was stopped here the last of December, and the men will start working at the Stephenson on January 2nd, 1920. The work of preparing the Stephenson Mine for resumption of operations is being pushed and there was a small amount of ore hoisted during the latter part of December. It will require some time to complete the work of cleaning up, re-timbering levels and sub-

GENERAL REMARKS:

levels, but it is only a matter of a few months until this mine is again in full operation.

There has not been an appreciable shortage of labor during the year, although at times there has been a shortage, especially at the Gardner-Mackinaw Mines. The curtailing of operations at mines in other districts released considerable labor the latter part of the year, and all the mines in this district have been full-handed for the past several months. Owing to the resumption of operations at the Stephenson Mine there is now a shortage of fully 100 miners, and this number can be given employment at the Stephenson Mine within the next several weeks.

On January 1st, 1919, there were 618 men employed in the district. On December 31st, there were 739, the increase for the year being 121.

Building operations of the company during 1919 were confined to the erection of two double houses in Gwinn and the completion of the seven double houses, the erection of which was started in 1918 at the Gardner-Mackinaw Location. Three houses were built in Gwinn on lots which had been sold, and a new store building was started, which it is expected will cost \$10,000.00.

Practically all of the men who enlisted and were drafted in the army and navy have returned to the district, and have been given employment.

During the summer and early in the fall a number of young men in the district left for manufacturing points in the lower peninsula, where they obtained employment in the factories. A few of them have returned, but the majority of them report good positions at high wages.

The influenza epidemic, which started the last of November, 1918, and continued during December, terminated about the 20th of January, 1919, and there were no further cases during the winter. Two mild cases were reported in November, but thus far there has been no re-occurrence of last years epidemic.

Practically all houses in the locations are now occupied. The re-opening of the Stephenson Mine will bring considerable additional men into the district and more houses are needed. I have recommended that fifteen single houses be built in Gwinn in 1920, and it is a question whether this number will be sufficient to provide for the additional employes needed.

GENERAL REMARKS:

AUSTIN MINE.

The Austin Mine was operated on one eight-hour shift during the last five months of the year. The product was very low in August and September, due to re-opening the mine. The product for the year was as follows:

BESSEMER,	3,592	tons	
AUSTIN,	39	"	
AUSTINPORT,	<u>11,265</u>	"	
TOTAL,	14,896	"	
 ROCK,	 <u>4,896</u>	 "	
TOTAL ORE AND ROCK,	19,792	"	

As the bottom of the Austin Mine is level with a point between the 3rd and 4th levels of the Stephenson Mine, the mine was drained of water sometime before all the water was out of the Stephenson. The work of repairing the shaft and opening drifts, preparatory to resuming operations, was started the first of August and a small product obtained during the last two weeks of the month. This work was continued during September; in October the product showed a gradual increase and operating conditions became practically normal the last of November. Shipments for 1919 and balance of ore in stock, are as follows:

	<u>SHIPMENTS</u>	<u>BALANCE OF ORE IN STOCK</u>
Bessemer,	0	3,592
Austin,	39	0
Austinport,	<u>2,295</u>	<u>8,970</u>
TOTAL,	2,334	12,562 tons.

The ore in sight at the Austin Mine on December 31st, is as follows:

	<u>AUSTIN BESSEMER</u>	<u>AUSTIN</u>	<u>AUSTIN- PORT</u>	<u>TOTAL</u>
Above 1st Level,	12,000	3,000	9,416	24,416
" 2nd "	36,800	5,251	20,700	62,751
" 3rd "	28,600	4,100	16,326	49,026
" 4th "	9,600	1,623	5,550	16,773
" 5th "	<u>3,180</u>	<u>562</u>	<u>1,860</u>	<u>5,602</u>
TOTAL TONS,	90,180	14,536	53,852	158,568

If a comparison be made with the estimate in last year's report, it will be noted that there are only a few minor changes on the lower levels. It

is interesting to note that the greater part of the ore hoisted this year came from scrambling operations in the territory where mining operations had been completed. When the mine was flooded, the greater part of the drifts on main levels caved, and when the mine re-opened it was necessary to drive through this caved ground. In practically every case ore was found and a considerable part of the product obtained this year came from this work. This ore is probably the wedge-shaped piece which lay on the foot-wall between the main drift and the sub above. Owing to the flatness of the foot-wall it is probable that part of this ore had not been previously mined, as it was merely a small triangle of ore lying on the foot. After the main haulage drifts were opened up, the old drifts on the various levels were continued out through caved ground towards the limits of the ore body, and in practically every case they are advancing in ore. It is planned to do considerable scrambling through the old stopes as it seems likely that this work will result in recovering considerable ore that was lost in the original mining operations.

The pumps which were operated in the Austin shaft in 1918 were continued in operation during the first five months of 1919, by which time the second Layne & Bowler pump had been installed in the Stephenson shaft and the water lowered to the 5th level, Austin. From this time on the water was all handled by the pumps in the Stephenson shaft; the pumps were taken out of the Austin shaft in July, by which time all the water was out of the Austin Mine. The work of re-opening the mine started in August, with a small crew of men repairing the shaft. Considerable repairs were necessary owing to the fact that the timber had rotted in the upper part of the shaft, due to the heat from the steam pipes and the exhaust steam from the steam pump. The shaft repairs were completed about the middle of August, so that the skip could be put in commission; the work of cleaning up and re-timbering the levels was then started and completed in November.

The work in detail for the year was as follows:

SUBS ABOVE 1ST LEVEL.

Near the end of the year a contract started cleaning up the old 84-ft. sub level, which is thirty-six feet above the 1st level. There is an old drift on this sub-level, about 160 feet in length, and up to the close of the year they had re-timbered and cleaned up the caved ground in this drift for a distance of about 130 feet.

FIRST LEVEL.

The main haulage drift on the 1st level has been repaired in to the ore body, but no further work was done here, as it will be impossible to start mining on this pillar for several years.

SUBS ABOVE 2ND LEVEL.

Repairs have been made on the 132nd and 142-ft. sub-levels, the old drifts on these subs being re-opened and re-timbered. It will not be possible to do any work in the shaft pillar here for a year or more, but it is planned to keep the main tramming drifts on these sub-levels opened so that they will be ready when the mining of the shaft pillar is started.

SECOND LEVEL.

Two contracts have worked on the 2nd level ever since the mine re-opened, re-opening the old haulage drifts along the foot wall. The drift to the south-east has been re-opened for a distance of nearly 700 feet from the shaft. Considerable ore has been obtained from this drift in re-timbering through the caved ground, along the foot-wall. The breast of the drift at the end of the year was about 75 feet from the big stope opened in ore at this end of the deposit. This stope was near the sand run which came in many years ago, and it is expected that some ore will be found here in pillars, which were not mined due to the sudden inrush of sand. The drift to the north-west along the foot-wall has been driven in new ground between the old drift and the foot-wall. It has been in ore the entire distance. It has now passed beyond the limits of the shaft pillar, and it will be extended to the old stopes further to the West, as it is expected that sufficient ore will be recovered here to more than pay for the work of re-opening the old drift along the foot-wall.

THIRD LEVEL.

Two contracts have worked on the 3rd level since the mine re-opened. The rock drift which was started to the south-east of the cross-cut to the shaft some time before the mine was flooded has been extended to the south-east in the foot-wall a distance of 200 feet. At this point it holed to the old drift in ore along the foot-wall. At the end of the year, when the mine closed, this drift had advanced about twenty feet in caved ground, from which considerable ore

was bring recovered. Before the mine was flooded, a drift had been driven about 175 feet further along the foot-wall through the old stope. It is planned to again go through this ground, as it is expected that considerable ore will still be found along the foot-wall. The rock drift driven by this contract rendered it unnecessary to re-timber about 300 feet of the old drift along the foot-wall; raises will later be put up from this rock drift to mine the shaft pillar between the 3rd and 2nd levels.

The drift to the north-west along the foot-wall has advanced about 200 feet; it has been in ore for the greater part of the distance. If results continue favorable, it is planned to extend it through the old stope to the West end of the ore body.

No. 2 shaft at the Austin had been raised from 3rd to 2nd level some time before the mine was drowned out. The drift connecting the two shafts had been driven from No. 1 over to No. 2 and was up-grade in favor of the haulage to the operating shaft. When it becomes necessary to abandon No. 1 shaft and start working at No. 2, it will be necessary that the grade be in favor of No. 2 shaft. Shortly after re-opening in August it was decided to stope up the bottom of the drift between these two shafts in order to establish a proper grade. This rock work was started in August and completed in October.

SUBS ABOVE 4TH LEVEL.

Shortly after the mine re-opened a contract started working on the sub-level, thirty-two feet above the 4th level, this being the first sub under the 3rd level. They are mining the shaft pillar under the hanging, and up to the close of the year had removed 20% of the pillar on this sub-level. It is planned to mine out all of the shaft pillar on this sub.

FOURTH LEVEL.

Two gangs have worked on the 4th level since the mine re-opened. The cross-cut from the shaft was first re-timbered and cleaned up; they have since drifted along the foot-wall to the south-east and south-west, mainly in ore, following the old foot-wall drifts. One of these gangs has just started to mine part of the old shaft pillar on the 4th level; the other one is extending the old foot-

wall drift south-east of the shaft through caved ground.

SUBS ABOVE 5TH LEVEL.

Two subs have been re-opened between the 4th and 5th levels, and mining was in progress on both of them at the close of the year. A few small pillars which had been left on these sub-levels are now being mined. One contract has worked on the 295-ft. sub-level, twenty-one feet above the 5th level, and three gangs on the 305-ft. sub, eleven feet above the 5th level. The work on these subs was not started until November. There is still a considerable quantity of ore remaining in the pillars on these old subs.

FIFTH LEVEL.

After the haulage drift from the shaft was cleaned up and re-timbered, drifts were started to the south-east and south-west. At the end of the year there were two gangs working to the south-east, both of which were mining small pillars of ore left along the foot-wall. The drift to the south-west was driven in rock a distance of about 100 feet and two raises put up to the 305-ft. sub, eleven feet above the 5th. There has been no further work done at this point. It will require nearly another year to finish all mining on this level.

SUBS ABOVE 6TH LEVEL.

When the mine re-opened, the old incline haulage road from the 5th level to the 6th level was put in condition for operating, and after the old 6th level was repaired, two raises to the old subs were also repaired and drifts started about half way between the 5th and 6th levels. Since that time drifting has been continued on this sub, the drifts being driven through old caved ground. The amount of ore recovered here was sufficient to warrant the continuation of this work next year. It is expected, however, that all available ore on this sub-level, in fact all the ore between the 5th and 6th levels, will be removed in a short time after work is resumed here next Spring.

The above outline covers the work done at the Austin Mine since it re-opened last August. The estimate of production shows 158,568 tons of ore on this property, all of which exists as a shaft pillar. Any ore recovered outside the limits of the shaft pillar is not included in the above estimate of ore in sight in the mine. It will apparently pay to continue the scrambling operations

at least until the foot-wall drifts have advanced to the limits of the ore body. This will undoubtedly result in the recovery of a considerable quantity of ore, which has not been included in the estimate. This work is justified as long as this ore can be recovered at a reasonable cost.

The last three days of December the majority of the men employed underground were engaged in propping up the drifts on the main levels and sub-levels, so that they would be in good condition when operations are resumed next April.

AUSTIN SURFACE.

On re-opening the mine, repairs were made to the shaft house which is badly out of line, due to settling of the ground. The timbers in the shaft house are also in bad condition, due to rotting, but this is not surprising when it is considered the shaft house is now over fourteen years old. Two 40-ft. braces were put in to counter-act the tipping, and the opposite side of the shaft guyed with two 1-1/8" wire cables. Considerable repairs will be necessary before operations are resumed next Spring, but unless conditions become rapidly worse, it seems that it will be possible to use this shaft house another year.

The railroad tracks at the shaft had to be lowered, due to the settling of the shaft house, as it was not possible to get a car under the railroad pockets. These tracks were taken up and lowered for a distance of about 200 feet below the shaft, and the tail room track, beyond the shaft, raised, which made it possible to handle cars to the pockets. Sales of ore were so small that it was necessary to re-erect the stocking trestles in order to take care of the product. There are two grades of ore at this mine, and it was necessary to put up two trestles, one for stocking Austinport ore and the other for Austin Bessemer.

In the spring of 1919, a temporary hoist was set up near No.2 shaft as it was planned to mine some ore on the upper levels in case the water could not be lowered at the Stephenson so as to permit of operating No. 1 shaft.

AUSTIN MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR 1919.

GRADE	IRON	PHOS.	SILICA	MANG.
Austin Bessemer,	60.79	.058	6.82	.427
Austin,	58.48	.097	10.28	.427
Austinport,	58.85	.237	8.58	.464

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR 1919.

(Cargoes all Mixed).

ORE STATEMENT - DECEMBER 31ST, 1919.

	AUSTIN BESSEMER	AUSTIN	AUSTINPORT	TOTAL	TOTAL LAST YEAR
On hand Jan. 1st, 1919,					7,464
Output for Year,	3,676		11,220	14,896	
Transferred,	84	39	45		
Stockpile Overrun,					1,069
Total,	3,592	39	11,265	14,896	8,533
Shipments,		39	2,295	2,334	8,533
Balance on hand,	3,592		8,970	12,562	0
Increase in output,				14,896	
Increase in ore on hand,				12,562	

1919 -1-8 Hour Shift from Sept. 1st to Dec. 20th

1918 - Mine idle account water.

AUSTIN MINE

SHIPMENTS FOR YEAR 1919.

GRADE	POCKET	STOCKPILE	TOTAL	TOTAL LAST YEAR
Austin Bessemer,				3,054
Austin,	39		39	740
Austinport,	2,295		2,295	4,739
Total,	2,334		2,334	8,533
Total last Year,		8,533	8,533	
Decrease - 73%			6,199	

AUSTIN MINE.

AUSTIN MINE.

COMPARATIVE MINING COST FOR YEAR.

	1919.	1918.	1917.
PRODUCT	14,869	1,069	51,659
General Expense	.368		.145
Maintenance	.464		.148
Mining Expense	2.578		1.228
Cost of Production	3.410		1.521
DEPRECIATION.	-		
Taxes	.146		.045
Central Office	.085		.061
Miscellaneous	.004		.008
Idle Expense			.031
Sundry Expense	.011		.014
Cost on Stockpile	3.656		1.680
Loading & Shipping	.032		.039
Total Cost on Cars	3.688		1.719
COST OF PRODUCTION.			
Labor	2.492		1.119
Supplies	.918		.402
Total	3.410		1.521
No. Days Operating	112		112
No. Shifts & Hours	1-8hr		1-8hr
Avg. Daily Product	133		257

Mine closed account of flood in 1918; started production again Aug., 1919.
 Production for 1918 as shown is stockpile overrun.
 Mine ceased production Dec. 31, 1919, for balance of winter.