

ATHENS MINE - 1923.

The product for the year was as follows:-

Athens Ore,	245,545 tons,
Rock,	1,087 "

This product came from the following areas:- Above the fourth level on the South foot where mining started a couple of years ago; Above the sixth level on the North and South sides of the main Northeast-Southwest dike; Above the eighth level on the continuation of the mining started above the sixth level West end; and above the ninth level at the West end adjoining the Bunker Hill line.

No ore was mined from either the Corbit or Mitchell Leases during the year.

Last year it was decided to bring the production to a 400,000 tons per year basis, which meant 33,333 tons per month. All available men were put to work and in October 1922 a night shift was started. Mining on the day and night shift continued this year until the end of April, when on account of a shortage of labor, it was necessary to go back to day shift only. In January there was an average of 156 men employed underground. This dropped monthly until July, at which time there were but 112 men underground. From then to the present time, there has been an increase and in November there were 142 men. Labor conditions seem to be more favorable at present and probably will continue so during the winter season. There has been considerable construction work in and about the city during the past two years which will be continued during the coming season. With the advent of warm weather, there is likely to be another labor shortage.

UNDERGROUND.

SUBS ABOVE THE FOURTH LEVEL.

SOUTH FOOT.

330' SUB LEVEL.

Work was in progress here on the first of the year and the sub

level was completed in April.

340' SUB LEVEL.

Work in this area was started in April and completed in November.

355' SUB LEVEL.

This sub level was opened in October - development work being carried on from all four raises.

In December at #431 raise one contract was stoping to the North, another to the East, a third developing to the West.

At #432 raise one contract was developing to the East, another to the West.

At #433 raise one contract was stoping to the East, another to the Northwest.

At #434 raise one contract was driving a development drift to the East, while two contracts were stoping to the Southwest.

FOURTH LEVEL.

In November #610 raise from the sixth level holed to this level at a point 50' Southwest of where the drift which parallels the dike intersects the North foot wall drift.

SUBS ABOVE THE SIXTH LEVEL.

SOUTH SIDE OF DIKE.

470' SUB LEVEL.

Work was in progress here on the first of the year around #635 raise. The sub level was finished in April.

480' SUB LEVEL.

The work here started in May at #435 raise, the sub level being completed in November.

495' SUB LEVEL.

Work started here in September at #637 raise and is still in progress.

In December one contract was stoping Northwest of #636 raise.

At #635 raise one contract was developing to the East, another stop-

ing to the Northwest.

515' SUB LEVEL.

Last year a drift was driven 45' Northwest from #635 raise where it stopped at a point a few feet from the dike. In November of this year this drift was extended through the dike and connected with the new traveling way between #644 and #646 raises.

In December one contract was cutting out at this elevation at #636 raise.

NORTH SIDE OF DIKE.

480' SUB LEVEL.

Work was in progress here on the first of the year. The sub level was completed in March when the pillars were removed at #655 raise.

495' SUB LEVEL.

Work was in progress here the beginning of the year, the sub level being completed in August by the removal of pillars at #655 raise.

505' SUB LEVEL.

Work started here in January at #647 raise and continued throughout the year.

In December the following contracts were employed on this sub level:-
At #655 raise two contracts were stoping to the North and one to the Southeast;
At #655-A raise one contract was stoping to the Southwest.

515' SUB LEVEL.

The development work of this sub level was done in 1918 and 1919. Mining started in September of this year and is still in progress.

In December one contract was stoping to the Southwest of #648-A raise.

At #648, #647-B and #647 raises, respectively, contracts are stoping to the Northwest. At #646 raise one contract is developing to the Northwest.

SIXTH LEVEL.

A 90' back-switch from #4 crosscut was started in March and completed in June. From the inside end, #610 raise was put through to the fourth level,

the raise being completed in November. This raise is of the ordinary two compartment type and was put up to help the ventilation of the mine. At some future time it can be used to handle ore. Material in raise #610:- 0' to 25' slate; 25' to 45' mixed ore and slate; 45' to 240' ore.

In May, #814 raise which had previously been put up from the eighth level was connected to #3 crosscut. This was done to help the ventilation.

During the year the following single compartment raises were put up to the 515' sub level:-

From #5 crosscut raises #655-B, #656-A and #656-B;

From #4 crosscut, raises #647-B, #648-A and #648-B.

Double compartment raise #637, in #3 crosscut, which was stopped last year in mixed ore and jasper at a height of 43', was extended during the year to the 480' sub level in mixed material evidently along the dike.

Mining at the Southwest end of #4 crosscut was started in May and completed in October.

SUBS ABOVE THE EIGHTH LEVEL.

600' SUB LEVEL.

This sub level is below the extreme Southwest end of the sixth level. Work started here in April and continued throughout the year.

In December one contract was stoping to the Southeast of #852 raise. The sub level will probably be completed in January.

615' SUB LEVEL.

This was started at #852 raise in November.

In December one contract was developing to the Southwest toward the foot wall, another Northwest toward the hanging and a third drifting Southeast toward #853 raise.

EIGHTH LEVEL.

In May, double compartment raise #910, from the ninth level, put up for ventilating purposes, was holed to #810 crosscut at a point 30' South of the main shaft crosscut.

Old raise #921 from the ninth level was retimbered and a drift of standard width driven to #820 crosscut. This was also done for ventilating purposes.

SUBS ABOVE THE NINTH LEVEL.

815' SUB LEVEL.

Work was in progress here at the first of the year. The sub level was completed in April at #913 raise.

830' SUB LEVEL.

Work started here last year and continued practically throughout the whole of the present year. It was completed in November at #913 raise.

840' SUB LEVEL.

Work which was started in December 1922 was continued throughout the year.

In December at #926 raise one contract was stoping to the North, another to the Southeast and a third to the Southwest.

At #928 raise one contract was stoping to the South, two to the Northwest.

855' SUB LEVEL.

Work was started here in March and continued throughout the year.

In December the contracts were distributed as follows:-

At #914 raise one was stoping to the North, another to the Southwest, and a third developing to the Southeast.

At #913 raise one was developing to the South.

A roll of rock, probably foot wall material, has been encountered to the South of #915 raise which extends Easterly to a point midway between #914 and #913 raises. Previous to December it was mixed but now shows solid structure.

865' SUB LEVEL.

Work was started here in November at #916 raise.

In December the following work was in progress:-

One contract was driving a development drift from #916 to #918 raise,

another was drifting from #915 to #916. The latter drift is almost entirely in rock. This is the roll on the foot reported under the 855' sub level.

NINTH LEVEL.

No. 910 raise was put through to the eighth level for ventilating purposes in May.

TENTH LEVEL.

In December work was started here. The track was cleaned from the shaft to the ore contact Southwest of #1010 raise. At this point retimbering is now in progress.

UNDERGROUND IN GENERAL.

Mining conditions during the early part of the year were most unfavorable on account of poor ventilation, making it impossible for the men to do as much work as they would have done in good air. During the latter part of the year conditions were better.

I called attention last year to the rapid decay of the mine timbers, brought about by fungus growth - conditions for which were most favorable due to the poor ventilation and high humidity. New timber in certain sections of the mine deteriorated so rapidly that it had to be replaced within a year. During the past summer we started using timber which had been treated at the mine with zinc chloride solution. It is a little early to tell what the results of this treatment will mean, but apparently fairly good penetration was obtained, which should greatly lengthen the life of the timber. The treated sets which have been underground from six to eight months have shown no signs of rot.

The mining has been carried on according to the original plan, i.e., starting at the bottom of the deposit and working upward. It has been necessary to work over a considerable territory in order that the upper ore be mined without being caved by lower operations. The pillars at the limits of mining have been left on an angle of approximately 50°. Above the sixth level a number of single compartment raises were placed between the double compartment raises so as to cut down tramping distance and to permit more contracts

in this territory. By this means we are able to mine the areas much more quickly where there is excessive weight. There were practically no new developments during the year.

VENTILATION.

Reports for 1921 and 1922, have gone into the subject of ventilation which has given us considerable trouble.

From the time the mining started at the Athens until May 1921, no trouble was experienced with the air which was supplied by natural ventilation, the same as at the other mines in this district. On March 26th, 1921, the mine which had operated on two 8-hour shifts per day was changed to five 8-hour shifts per week and on May 17th was further reduced to one 4-hour shift per day. About the middle of May the weather became warm and at once the underground air became poor. Tests on June 10th and 13th gave the following:-

TEMP.	HUMIDITY.	OXYGEN.	CO ₂
58°F.	100%	17.6	2.7

The composition of pure, dry, normal atmospheric air by volume is as follows:-

OXYGEN.	CO ₂	NITROGEN.	OTHER ELEMENTS.
20.93	0.03	78.10	0.94

The mine air on June 10th and 13th showed a serious depletion in the amount of oxygen and a large percentage of carbon dioxide. In July of that year a #11 Sturvetant Multivane Blower rated at 42,000 cu. ft. per minute against a 3" water gauge was installed on the tenth level and doors were built on the various levels to control the flow of air, that it should pass from surface down the cage compartment to the fan, thence up through the workings to the fourth level, thence into the skip compartment and up to surface. The skip compartment in the headframe being enclosed up to the head sheaves, while the cage compartment was open at the collar. It was expected that there would be a decided change for the better at once, but there was no change noticed in the quality of the air until September, after which it began to improve and by October it was practically normal. In January 1922 the fan was shut down on

account of ice in the cage compartment but was started again as soon as the surface temperature became warm. In May the air again became poor and on May 25th, 26th and 29th tests gave the following averages:-

<u>TEMPERATURE</u>	<u>HUMIDITY</u>	<u>OXYGEN</u>	<u>CO2</u>
59	100%	15.7	2.8

Investigations made by using anemometer and volumes of smoke showed that the exhaust air after entering the skip compartment at the fourth level passed through leaks in the cage compartment and thence down to the fan. There was practically no induced current in the cage compartment in the upper portion of the shaft. All visible cracks in the partition between the cage and skip compartments were covered with strips of wood and on June 14th, 1922 the analyses showed the following:-

	<u>OXYGEN.</u>	<u>CO2</u>
Incoming air on 10th level -	18.0	2.0
Outgoing air on 4th level -	17.2	1.8

During the remainder of the summer the air compressor was operated at night with all valves open in the sub levels. This helped slightly. The air again improved with the coming of the cold weather.

CAUSE.

The depletion of the oxygen and production of carbon dioxide are due to several causes, i.e., blasting, timber decay, crushing of timber, exhalation by the men and combustion of lights. As the mine grows larger all of these increase. Carbon Dioxide being heavier than air tends to seek lower levels and resists any effort to force it to surface.

REMEDY.

Early in the year we realized that the serious condition of the air would return with the advent of warm weather. The way to affect a permanent improvement would be to provide another shaft at the West end of the ore body and supply circulation in that way, using one shaft as a downcast for the fresh air to enter the mine, the other as an upcast for a discharge for the impure air. To provide a second outlet would require time and a large expenditure of

money. A remedy, if only temporary, had to be found as early as possible.

A thorough study of the mine was made by the Engineer, Mr. Nicolson, in which he found that if the mine resistance were decreased so that the fan could deliver its rated capacity of pure air and this could be properly distributed, that good results should be expected.

It was decided; 1st, To make the partition between the skip and cage compartments leak proof and by sealing all doors, prevent any possible short circuiting of the impure air into the fresh air course; 2nd, To reduce the mine resistance by providing extra raises from the tenth level to the ninth and from the sixth to the fourth levels; 3rd, To split the air current in two so that part of the impure air could pass out on the sixth level to the fourth, instead of all going through the workings to the fourth; 4th, To provide auxilliary blowers to take fresh air from the main levels and force it into the working places; and 5th, To segregate all worked areas as far as possible by bratticing them off so as to prevent the products of decomposition of the timber from getting to the fresh air courses.

The old workings were bratticed off in April, the raise from the tenth level holed early in May. Before starting the raise from the sixth to the fourth, a stub drift had to be driven on the sixth level. Toncon metal was ordered to seal the shaft partition. Electric operated blowers were installed on the ninth and sixth levels in April, flexible piping taking the air into the sub levels.

In May Mr. Daniel Harrington and Mr. Carrick of the Bureau of Mines, visited the Athens and after making a three days inspection, they approved of the work that had been started, however, Mr. Harrington recommended that the partition in the shaft be gunited rather than sheated, that this had been done in the Butte District with fine results and had the additional benefit of reducing the fire hazard. He further recommended that all secondary blower stations be fire-proofed. It was decided to gunite the partition and this work was completed on September 12th. A Goppus blower operated by air was

installed at the top of #852 raise about December 1st. This is giving fine results. Early in December the new raise from the sixth to the fourth level was completed and on December 18th the air tests showed the following results:-

LOCATION	VOLUME	OXYGEN	CO ₂	TEMP.	HUMIDITY.	W.G.
10th Level intake	39,000	20.9	0	54.5	98%	2"
4th Level exhaust	32,115	20.6	0.1	59.5	100%	$\frac{1}{4}$ "

By comparing these with the pure air, it is shown that there is practically no change in the oxygen and there is very little carbon dioxide in the exhaust air.

The following table gives the readings obtained on May 8th, the date of Mr. Harrington's visit, September 12th, the day after the guniting of the shaft was completed, and December 18th, after the new raise from the sixth level had holed to the fourth.

LOCATION	NATURE OF READING	MAY 8TH.	SEPT. 12TH.	DEC. 18TH.
Surface	Psychrometer	45° - 50%	41° - 68%	37°
10th level intake	"	59½ - 97	61 - 97	54.5 - 98%
	Water gauge	1 5/8"	2"	2"
	Volume - cu.ft.	21,120	28,250	39,000
	Oxygen	19.7	20.7	20.9
	Carbon dioxide	0.25	0.1	0.0
4th Level discharge	Psychrometer	60½° - 97%	61° - 97	59.5° - 100%
	Water gauge	$\frac{1}{4}$ "	2/5"	$\frac{1}{4}$ "
	Volume - Cu.ft.	12,470	19,390	32,115
	Oxygen	19.0	19.6	20.6
	Carbon dioxide	0.9	0.9	0.1

Of particular interest is the increase in the volume of air deliver by the fan from 28,250 to 39,000 cu.ft. or 38%, without any increase in the pressure required to force it through the mine. This is due to the completion of the raise from the sixth to the fourth level.

COST OF GUNITING.

	TOTAL 35,820 SQ.FT.	TOTAL PER SQ.FT.
Cleaning Shaft,	\$ 204.25	\$0.006
Expanded metal lath,	1,253.30	0.035
Laying metal lath,	440.00	0.012
Sand (at shaft house),	376.93	0.011
Mixing and Bagging,	297.70	0.008
Cement,	877.50	0.024
Guniting,	965.93	0.027
Total -	\$4,415.61	\$0.123

No. bags mixture,	4,352	Sq.ft. per bag mixture,	8.23
" " sand,	3,182	" " " sand,	11.25
" " cement,	1,170	" " " cement	30.6

Average mixture used 1 to $2\frac{3}{4}$.

Cost per yard of screened sand delivered at shaft house, \$3.20.

	<u>CLEANED.</u>	<u>REINFORCED.</u>	<u>GUNITED.</u>	<u>TOTAL.</u>
Square feet,	35,820	35,820	35,820	35,820
No. of shifts,	10	22	41	73
Average,	3,582	1,628	874	490

Expanded metal lath $3/8$ by $3/4$, galvanized, 24 gauge.
Zinc nails used to nail lath to partition boards.

TANKS FOR FIGHTING FIRES.

Two 100-gallon tanks each mounted on trucks have been placed underground. Each tank is supplied with 400 feet of hose. The tanks are filled with water and connections are made on the tanks so that they can be readily refilled. In case of an underground fire, the truck can be taken as near as possible to the scene of the fire, air pressure applied to the tank from the air line and the hose taken to the fire whether on the level or in the subs.

GUNITING.

The partition between the skip and cage compartments in the shaft, all mine doors and the fan stations, were gunited during the year. At the fan stations and doors no reinforcing material was used, but in the shaft, galvanized expanded metal lath was nailed to the casing plank with zinc nails, and the gunite applied to this, making a thickness of about $1/2$ inch. The shaft work was started in June and finished September 12th. The cost is detailed under "Ventilation".

WATER.

The average number of gallons of water pumped per minute as compared with 1922 is as follows:-

	<u>1923</u>	<u>1922</u>
January	186	146
February	185	146
March	188	147
April	190	152
May	194	157
June	193	163
July	198	169
August	199	174
September	203	175

October	203	178
November	204	177
December	205	184
Average -	195	164

There has been a gradual but consistent increase in the number of gallons pumped per minute throughout the past two years.

FATAL ACCIDENT.

On the morning of October 29th, Algot Carlson, a chuteman, was instantly killed when the motor on which he was riding crashed into a partly opened ventilating door on the sixth level near the shaft. The door where the accident occurred is operated by an air cylinder for opening and closing, however, it was out of repair and during the latter part of the week before, it had been hooked back so that it remained open. On Sunday night the hook was released and the door closed by the pumpman, it being his duty to see that all ventilating doors were closed unless undergoing repairs. On Monday morning one of the miners on his way in to work, opened the door by means of the wire which operates the air cylinder.

The mine timberman, with his crew, was working a few feet inside of the door at the time of the accident. He was unaware that the door had been closed on Sunday and reopened on Monday morning and supposed that it was hooked open.

When Motorman Kainainen came out with his first trip of cars, he was seated on the front left side of the motor, while on the rear of the motor were Brakeman Wills and Chutemen Carlson and Johnson. After passing the inside ventilating door, he could see the green lights at the outside door, which showed that the door was open. As Kainainen approached the door, he looked at the left side of the drift to see that the track was clear where the timbermen were working. On glancing up, when within a few feet of the door, he noticed that it was partly closed. Although he was running at low speed, it was impossible for him to stop and the motor crashed into the door. The motor passed through the door opening tearing the door loose at its middle and bottom hinges. The door was pushed through the frame, passed over the top of the motor, and landed

on top of the first car. The train stopped with this car about two-thirds of the way through the opening. The motor had become derailed, preventing the train from running further.

Carlson was evidently instantly killed, either by being hit by the door or else coming in contact with the door frame. His skull was fractured. Johnson's neck was caught between the top of the car and the door and he was nearly strangled. Wills had the skin scraped off of the back of his left hand, while Kainainen escaped without injury of any kind.

After the accident, on examining the wires which control the valves that operate the door, it was found that they were in the position for the door to close. By pulling the levers it was impossible to change them from this position. This door had recently been gunited and the wires which passed through the door frame were coated with gunite. When the miner opened the door in the morning, the top wire with the gunite was pulled into the door frame and evidently stuck there. When the motor came out to the shaft, either by jarring due to the train or someone touching the top wire caused this wire to break loose, permitting the valve to take the position for closing the door. This occurred when the motor was within a few feet of the door.

It was known that the wires for this cylinder were not in good repair. They had been loosened by rock falling on them and the timbermen were repairing the drift so that they could be properly adjusted. The boss timberman supposed that the door had not been changed since it was hooked back on Thursday of the week previous. The door had been opened and closed probably twenty times a day since it had been gunited and in all this time it had never before known to catch.

Carlson was a married man and had a wife and one child.

WATER COLUMN.

At a point 800' below the collar of the shaft, a cast iron flange in the water column broke in October. The upper portion of the column had to be supported while the section with the flange was taken out, a new flange fitted and the section replaced. This work was done November 4th.

SURFACE.

STEEL STOCKING TRESTLES.

The erection of the steel stocking trestle started in the fall of 1922, ore being stocked from the South track of the North trestle on December 18th. The Worden-Allen construction crew completed their work on January 3rd, 1923. The concreting of the tubes continued during January, but on account of the extremely cold weather, three tubes were left until summer. On January 29th, it was noticed that two of the tubes showed a bulge and on examination it was found that several rivets had sheared off, bursting the outside shell at this point. It was decided that this was probably due to a thin film of ice forming between the shell and the concrete, following a warm day when melting occurred. Holes were drilled in each section of the tubes so as to permit any seepage which might occur on the warm days. After this was done, no further stress was shown in the shells. The bursting of these shells does not in any way effect the strength of the trestle as the concrete in each column is reinforced near the outside edge by vertical rods of steel.

On February 16th, a settling was noticed on the North track of the North trestle at the second pier from the headframe. This was due to buckling of the gusset plate which fastens the knee brace to the horizontal channels from the top of the pier. On top of these channels rest the plate girders for the North track. This buckling was due to structural weakness. By placing wooden trestle legs beneath the girders, we were able to continue stocking on this trestle without any delay. The Worden-Allen Company immediately sent a construction crew on the job and strengthened the whole trestle, remaining here until May 10th. No other structural weakness has developed.

In July the three end piers of the Southeast trestle were concreted and during the summer the ties and rails were laid on this trestle.

STOCKPILE.

In July, with the completion of the concreting of the last columns at the Southeast trestle, the sollar was levelled off and in August broken rock

was spread over the surface of the sand. In October this was rolled with a steam roller and made ready for stocking the winter product.

COOLING POND.

Heretofore the circulating water for the compressor has been cooled by a cooling tower. This was built several years ago. In 1922 a new compressor was installed and since then at times it has been necessary to run both compressors. The cooling tower was inadequate for the two machines so it was decided to make a cooling pond similar to the one used at the Holmes Mine. In May and June this pond was constructed just South of the engine house. It is made of gunite 3" thick reinforced with chicken wire. It is equipped with thirteen spray jets.

GUNITING HEADFRAME.

The wooden housing over the cage compartment was covered on the outside with expanded metal lath 3/8 by 3/4" mesh 24 gauge and gunite applied, making this section practically fire-proof from the outside. The doors over the top of this compartment are made of steel.

The inside of the headframe from the landing platform to the top was guniting in September and October. The gunite was applied to expanded metal lath tacked directly to the inside of the sheathing which covers the headframe.

TIMBER TREATING PLANT.

Last year the experimental timber treating plant consisted of two vertical tanks, located at the extreme Western end of the timber yard. In July of this year, two old boilers from the Negaunee Mine were installed a short distance to the Southwest of the treating plant. These were placed horizontally and at an elevation that will permit the zinc chloride solution from the vertical tanks to flow into them by gravity. By this arrangement timber is placed in the vertical tanks when they are empty, a cover placed over the timber, after which air pressure is applied to the liquid in the horizontal tanks which forces the treating liquid into the vertical tanks. Twice as many pieces can be treated than formerly and the change of solution from hot to cold can be made

in half an hour. The results obtained on seasoned timber by this open tank method is very satisfactory. The plant was inspected twice during the year by Mr. Hunt of the Forestry Department of the Government.

In order to get any penetration it is necessary for the timber to be peeled and have from three to four months seasoning before treating. Green timber shows practically no penetration.

COSTS.

The following figures are based on timber treated for the period, June to September 1923, inclusive.

Number pieces 8-foot long treated,	983		
Hours labor handling timber,	606		
		<u>Per Pc.</u>	<u>Per Ft.</u>
Cost for handling	\$.260		\$.033
Cost for chloride of zinc,	.147		.018
Estimated charge for heat, water and air per piece,	.060		.007
Total -	\$.467		\$.058
Cost per piece for peeling,	.250		.031
Total cost for peeling and treating -	\$.717		\$.089

The cost above includes peeling timber, although for the past year and one-half, practically all main level timber used in the district has been peeled, whether treated or not, to give it added life.

EXTENSION TO TIMBER YARD.

The West end of the timber yard was graded slightly during November to provide skidding room opposite the treating plant. From now on the Athens plant will treat all timber for main drifts for the mines in the Negaunee District. Consequently the large timber for this district will be unloaded at the Athens, framed, peeled and treated there and delivered to the various mines after treating.

STOCKING PRODUCT.

During July orders were received to make all shipments, with the except-

tion of those to Charcoal Furnaces, from the stockpile. This was due to complaints from some of the Lake Erie customers that difficulty was had in unloading Athens Ore. Stockpile ore gives less trouble from this source than ore loaded directly into the cars from the skips. From that date, all ore except to Charcoal Furnaces has been stocked.

ROCK TRAM ENGINE HOUSE.

An engine to handle the rock car has been purchased and will be installed in a small gunited building which has been built beneath the rock trestle. The concrete base for the engine has been poured and the engine should be in commission early in January.

The type of engine is similar to the ore tram engines with the exception of the rubber lined sheave which is 6' in diameter instead of 8'. This sheave is mounted on the end of the shaft which will make the installing of new ropes much simpler than heretofore.

DELAYS - ELECTRICAL.

- April 6th - 8 hours idle account of no current, water low at power plant.
- July 20th - 1 hour 20 minutes delay account of no current.
- July 26th - 4 hours idle account of no current, water low at power plant.
- August 18th - 1/2 hour delay account of no current.

DELAYS - NON-ELECTRICAL.

- January 3rd - 1 hour delay day shift and four hours night shift account of hoisting rope poor and had to be changed.
- June 18th - 1 1/2 hours delay account of skip hoisted too high.
- June 19th - 1 hour delay account of skip hoisted too high.

ESTIMATE OF ORE RESERVES IN ATHENS MINE DECEMBER 31, 1923.

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

Percentage of Bessemer equals 0.

DEVELOPED ORE.

Fourth level and above - - - - -	1,162,107	Tons,
Fourth level to sixth level, North side of dike - - - - -	556,672	"
Sixth level to 660' sub level, North side of dike - - - - -	527,107	"
660' sub level to eighth level - - - - -	1,166,737	"
Eighth level to ninth level - - - - -	506,562	"
Ninth level to Tenth level - - - - -	414,467	"
Below tenth level - - - - -	<u>61,130</u>	"
Total developed ore - - - - -	4,394,782	tons.

PROSPECTIVE ORE.

Fourth level to sixth level, South side of dike - - - - -	2,087,800	tons.
Sixth level to 660' sub level, South side of dike - - - - -	<u>475,048</u>	"
Total prospective ore - - - - -	2,562,848	tons.
Total All Ore - - - - -	6,957,630	tons.

ESTIMATED ANALYSIS

	<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°	59.80	.140	8.45	.264	.530	.430	.480	.012	1.15	
Natural	52.03	.121	7.35	.230	.461	.374	.418	.010	1.00	13.00

ATHENS MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR 1923.

GRADE	IRON	PHOS.	SILICA
Athens,	59.98	.134	7.27
Mitchell Lease,	(No Production)		
Corbett Lease,	(No Production)		

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR 1923.

GRADE	Mine		Lake Erie	
	IRON	PHOS.	IRON	MOIST.
Athens,	60.07	.131	60.22	12.70
Mitchell Lease,	(No Shipments)			
Corbett Lease,	(No Shipments)			

ORE STATEMENT - DECEMBER 31ST, 1923.

	ATHENS	MITCHELL LEASE	CORBETT LEASE	TOTAL	TOTAL LAST YEAR
On hand January 1, 1923,	139,383	9,686	760	149,829	221,729
Output for Year,	245,545	-	-	245,545	193,259
Transferred,	377	-	377	-	-
Total,	385,305	9,686	383	395,374	414,988
Shipments,	187,945	-	-	187,945	265,159
Balance on Hand,	197,360	9,686	383	207,429	149,829
Increase in Output,				52,286	
Increase in Ore on Hand,				57,600	

1923 -- 2-8 Hour Shifts, Jan. 1st to Apr. 29th, 1923.
1-8 Hour Shift, Apr. 30th to Dec. 31st, 1923.

1922 -- 1-4 Hour Shift, 6 days per week, Jan. 1st to June 4th, 1922.
1-8 Hour Shift, 6 days per week, June 5th to Dec. 31st, 1922.

ATHENS MINE

SHIPMENTS FOR YEAR-1923.

GRADE	POCKET	STOCKPILE	TOTAL	TOTAL LAST YEAR
Athens,	61,397	126,548	187,945	257,868
Mitchell Lease,	-	-	-	7,291
Corbett Lease,	-	-	-	-
Total,	61,397	126,548	187,945	265,159
Total Last Year,	84,551	180,608	265,159	
Decrease,			77,214	

ATHENS MINE

COMPARATIVE MINING COST FOR YEAR

	1923	1922	INCREASE	DECREASE
PRODUCT	245,545	193,259	52,286	
Underground Costs	1.341	1.100	.241	
Surface Costs	.221	.199	.241	
General Mine Account	.098	.102		.004
Cost of Production	1.660	1.401	.259	
Plant Account	.210	.210		
Taxes	.322	.424		.102
Central Office	.080	.096		.016
Contingent Expense	.004	.003	.001	
Cost Adjustment	.001	.007	.006	
Cost on Stockpile	2.275	2.127	.148	
Loading & Shipping	.026	.042		.016
Misc. Debits & Credits	.015	0		.015
Total Cost on Cars	2.286	2.169	.117	
No. Days Operating	300	303		3
No. Shifts & Hours	1-8	1-4:1-8		
Avg. Daily Product	818	638	180	
<u>COST OF PRODUCTION</u>				
Labor	1.032	.856	.176	
Supplies	.628	.545	.083	
Total	1.660	1.401	.259	

ATHENS MINE

COMPARATIVE WAGES AND PRODUCT

	1 9 2 3	1 9 2 2	INCREASE	DECREASE
PRODUCT	245,545	193,259	52,281	
No.Shifts & Hours	1-8hr	1-4		
AVG.NO.MEN WORKING				
Surface	41	32	9	
Underground	141	120	21	
Total	182	152	30	
AVG.WAGES PER DAY				
Surface	4.24	3.81	.43- 11%	
Underground	4.75	4.25	.50-10.5%	
Total	4.64	4.15	.49-10.5%	
WAGES PER MO. of 25 DAYS				
Surface	106.00	95.25	10.75	
Underground	118.75	106.25	12.50	
Total	116.00	103.75	12.25	
PRODUCT PER MAN PER DAY				
Surface	20.56	32.28		1.72
Underground	5.82	6.40		.58
Total	4.54	4.97		.43
LABOR COST PER TON				
Surface	.206	.171	.035	
Underground	.816	.664	.152	
Total	1.022	.835	.187	
AVG.PRODUCT BRK'G & TRM'G	9.58	10.14		.56
" WAGES CONTRACT MINERS	5.09	4.46	.63	
" " " TRAMMERS				
" " " LABOR	5.09	4.46	.63	
TOTAL NO.OF DAYS				
Surface	11,940	8,673	3,267	
Underground	42,171-3/4	30,195	11,976-3/4	
Total	54,111-3/4	38,868	15,243-3/4	
AMOUNT FOR LABOR				
Surface	50612.84	33019.46	17593.38	
Underground	200444.81	128420.96	72023.85	
Total	251057.65	161440.42	89617.23	

Mine started on operating basis Jan.1,1919.

Proportion Surface to Underground Men:

1923 - 1 to 3.44
 1922 - 1 to 3.75
 1921 - 1 to 3.88
 1920 - 1 to 3.83
 1919 - 1 to 3.

ATHENS MINE

TIMBER STATEMENT FOR THE YEAR ENDING DECEMBER 31, 1923.

KIND	LINEAL FEET	AVG. PRICE PER FOOT	AMOUNT	
			1 9 2 3	1 9 2 2
6" to 8" Timber	63,862	.0451	2,882.76	2,449.29
8" to 10" "	92,544	.0704	6,514.04	4,488.67
10" to 12" "	32,494	.0889	2,888.77	2,173.86
12" to 14" "	11,323	.1137	1,287.96	368.41
Total - 1923	200,223	.0677	13,573.53	
Total - 1922	171,025	.0554		9,480.23
	LINEAL FEET	PER 100'		
7' Lagging	765,600	.7957	6,092.08	4,617.77
Poles	200,034	1.166	2,333.42	1,960.52
Total - 1923	965,634	.872	8,425.50	
Total - 1922	788,781	.834		6,578.29
5/8" Cover Boards, sq.ft.	89,570	1.515	1,357.12	507.69
Product for year,			245,545	193,259
Feet of Timber per ton of ore,			.815	.885
Feet of Lagging per ton of ore,			3.118	3.169
Feet of Lagging per foot of Timber,			3.823	3.582
Cost per ton for Timber,			.0553	.049
Do. Lagging,			.0248	.024
" Covering Boards,			.0055	.0026
" Poles,			.0095	.0101
" Timber, Lagging, Poles & Boards,			.0951	.0857
Equivalent of Stull Timber to Board Measure,			328,170	254,091
Feet of Board Measure per ton of ore,			1.3365	1.315

Total cost for timber, lagging poles & boards, and cost per ton,

1923	\$23,356.15	\$.0951
1922	16,566.21	.0857
1921	23,169.19	.1316
1920	22,622.15	.1146

P.A.F.

ATHENS MINE

STATEMENT OF EXPLOSIVES USED FOR STOPING AND DEVELOPING IN ORE
-1923-

KIND	QUANTITY	AVERAGE PRICE	AMOUNT 1923	AMOUNT 1922
40% Powder	52,400	.1343	7,039.76	7,813.24
60% "	30,200	.1688	5,097.75	1,865.12
Hercules #1 Powder,				30.50
Total Powder - 1923	82,600	.1469	12,137.51	
Total Powder - 1922	66,450	.1461		9,708.86
Fuse	306,400	6.785M	2,079.08	1,779.05
Caps	57,200	11.489	657.19	537.68
Cap Crimpers	59	.455	26.83	11.55
Electric Exploders	200	64.10	12.83	
Total Fuse, Caps, etc.,			2,775.93	2,328.28
Total All Explosives,			14,913.44	12,037.14
Product,			245,545	193,259
Pounds of Powder per ton of ore,			.3364	.3438
Cost per ton for Powder,			.0494	.0502
Do. Fuse, Caps, etc.,			.0113	.0120
" All Explosives,			.0607	.0622
Average price per pound for powder,			.1469	.1461

9.12.23

SOUTH JACKSON MINE - 1923.

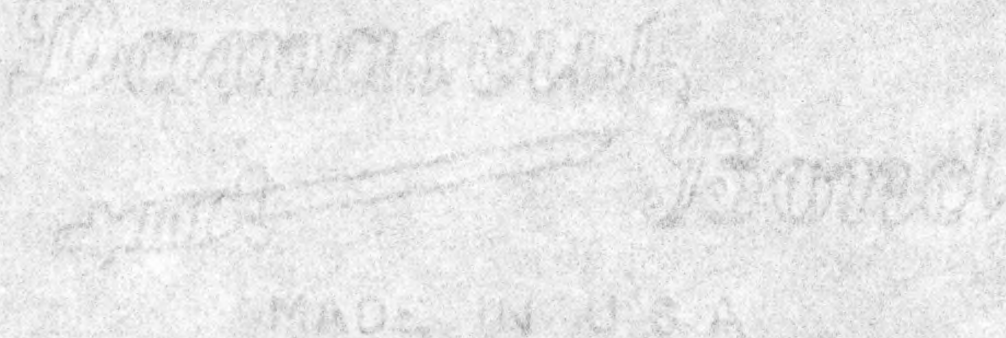
The product for the year was 12,812 tons.

Orders to open the pit were received the latter part of May. Loading started on the 29th, continued through June and was finished on July 2nd.

The ore all came from a cut along the North side of the pit.

After the pit was shut down a crew of three men was employed two weeks scraping back waste material from the bank at the Northeast end of the pit.

The Captain and one man repaired the drainage tunnel under the County Road in July.



ESTIMATE OF ORE RESERVES OF DECEMBER 31, 1923.

Above present pit available by present system of mining:

On Southwest side - - - - -	35,000 tons,
North of Lucy Pit - - - - -	5,000 "
South and Southwest of Lucy Pit - - - - -	<u>3,000 "</u>
Total -	43,000 tons.

Below present pit and above drainage tunnel available by milling:

West of Crusher - - - - -	186,000 tons,
Area below bottom of present pit shown by churn drilling - - - - -	<u>138,488 "</u>
Total -	324,488 tons.

GRAND TOTAL - 367,488 tons.

ANALYSIS

	<u>IRON</u>	<u>PHOS.</u>	<u>SUL.</u>	<u>MANG.</u>	<u>MOIST.</u>	<u>SIL.</u>
Natural	36.83	.066	.010	2.00	7.00	31.56

SOUTH JACKSON MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR 1923.

GRADE	IRON	PHOS.	SILICA	MANG.
So. Jackson,	38.54	.034	36.72	2.12

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR 1923.

GRADE	Mine				Lake Erie		
	IRON	PHOS.	SILICA	MANG.	IRON	MOIST.	MANG.
So. Jackson,	38.13	.032	37.82	2.10	36.98	6.90	2.73

ORE STATEMENT AND SHIPMENTS FOR YEAR 1923.

	YEAR	LAST YEAR
Output for Year,	12,812	16,101
Shipments,	12,812	16,101
Balance on Hand,	-	-
Decrease in Output,	3,289	
Decrease in Shipments,	3,289	

- 1923 -- Mine Idle, Jan. 1st to May 28th, 1923.
 1-8 Hour Shift, May 29th to July 2nd, 1923.
 Mine Idle, July 3rd, 1923 to Dec. 31st, 1923.
- 1922 -- Mine Idle, Jan. 1st to May 18th, 1922.
 1-8 Hour Shift, May 19th to June 18th, 1922.
 Mine Idle, June 18th to Sept. 15th, 1922.
 1-8 Hour Shift, Sept. 15th to Sept. 28th, 1922.
 Mine Idle Sec. 29th to Dec. 31st, 1922.

SOUTH JACKSON MINE

COMPARATIVE MINING COST FOR YEAR

	1923	1922	INCREASE	DECREASE
PRODUCT		16,101		16,101
Open Pit Costs	.521	.398	.123	
General Mine Accounts	.034	.025	.009	
Cost of Production	.555	.423	.132	
Original Cost	.803	.803		
Taxes	.354	.271	.083	
Central Office	.013	.013		
Contingent Expense	.002	.003		.001
Cost Adjustment	.033	.035		.002
Winter Expense	.163	.129	.034	
Total Cost on Cars	1.923	1.677	.246	
No. Days Operating	28	35		7
No. Hours & Shifts	1-10	1-10		
Avg. Daily Product	548	460	88	
<u>COST OF PRODUCTION</u>				
Labor	.265	.215	.050	
Supplies	.290	.208	.082	
Total	.555	.423	.132	

SOUTH JACKSON MINE

COMPARATIVE WAGES AND PRODUCT

	1 9 2 3	1 9 2 2	INCREASE	DECREASE
PRODUCT	12,812	16,101		3,289
No.Shifts & Hours	1-10hr	1-10hr		
AVG.NO.MEN WORKING				
Surface	1½	2		½
Underground (Pit)	8½	11		2½
Total	10	13		3
AVG.WAGES PER DAY				
Surface	4.91	4.04	.87	
Underground	4.93	4.20	.73	
Total	4.93	4.18	.85	
WAGES PER MO.of 25 DAYS				
Surface	122.75	101.00	21.75	
Underground	123.25	105.00	18.25	
Total	123.25	104.50	18.75	
PRODUCT PER MAN PER DAY				
Surface	453.54	179.40	274.14	
Underground	26.50	26.60		.10
Total	25.03	23.17	1.86	
LABOR COST PER TON				
Surface	.011	.022		.011
Underground	.186	.158	.028	
Total	.197	.180	.017	
TOTAL NO.OF DAYS				
Surface	28½	89-¾		61½
Underground	483½	605		121½
Total	511-¾	695		183¼
AMOUNT FOR LABOR				
Surface	138.80	362.75		223.95
Underground	2385.58	2540.42		154.84
Total	2524.38	2903.17		378.79

1922 - Mine only operated 35 days with 2 men surface and 11 in pit.

1923 - Mine only operated 28 days: from May 29th to July 2nd.

SOUTH JACKSON MINE.

NORTH JACKSON MINE - 1923.

Repairs were made in November to the North wall of the old brick blacksmith shop which is used by the Constabulary as a garage. The fill against the wall pushed it in and caused it to cave. A new wall of concrete and frame construction was built.

NORTH LAKE DISTRICT

MORRIS LLOYD MINES

GENERAL

The Morris-Lloyd Mines were in operation all the year full time on day shift and also prosecuted development work in the Morris Mine on the night shift until October month, when the night work was discontinued in order to conserve electric power wherever possible, due to shortage of water at the power plants.

Considerable new work was undertaken on surface during the year, the largest being the grading of additional stocking room account of the very small shipments having been made from these mines this year.

Additional landscape work was done around the office and change house grounds - and also in the tenant house location.

We have carried on development work all through the year notwithstanding our curtailed operations and have further increased our ore reserves.

The long drift West across the Chase Leases on the 7th level was driven 1600 feet during the year and the opening is now on Chase Lease No. 26.

The drift West on the 6th level was continued on to the Barnes-Hecker Lease No. 31, and a raise put up to the Barnes-Hecker bottom third level. All mines in the North Lake District are now connected underground. This makes for better ventilation and also provides a second outlet for the Barnes-Hecker Mine and an additional outlet for the Morris Mine.

A larger heating boiler was installed in our main heating plant and also a hot water pump. A small addition was made to the building in order to house this larger equipment.

A new steel storage house, 20' x 52', was erected during the early summer to house equipment. This is located near our shop building.

MORRIS LLOYD MINES

GENERAL
(CONTINUED)

A 30 ton wheel press was added to our machine shop equipment from the Crosby Mine dismantling and a new power plate shear was purchased for the blacksmith shop to replace the old one which was broken beyond repair.

We equipped the bottom level of the Morris Mine with nineteen (19) two ton rocker tram cars. This is a new type of car in our mines and we look for large economy in their operation as compared with the old saddle back car, both in repairs to the cars themselves and also in labor cleaning tracks. The old saddle back cars drop a considerable amount of dirt along the tracks which must be kept cleaned. This new car has a solid box and there is no spillage.

A new two ton White Motor Truck was purchased for the District and has been at work all summer and has given excellent service.

During the year we mined ore from Chase Leases in excess of requirements. Total requirements are 77,500 tons and the tonnage mined was 117,923 tons. The tons from the different leases appear in a statement further along in this report.

A programme of equipping all mines against fire has been laid out and the work commenced. Fire doors have been ordered, fire pails have been installed in all buildings and the work will be carried on until completed.

A new 1160 foot haulage cable costing \$1,057.32 was installed in the Morris shaft to replace the old cable.

We purchased 500 feet of 2 $\frac{1}{2}$ " hose for fire protection during the year to replace old hose worn out.

These mines are in good condition at the end of the year and are prepared to mine a much larger tonnage than heretofore. They also show the largest tonnage of ore in sight than at anytime in their history and the possibilities of still greater tonnage than that shown up are most favorable.

MORRIS LLOYD MINES

LABOR

We find it difficult to maintain a force of men at these mines. We have barely enough men to keep going on our curtailed schedule. We have never been able to get back to our 1921 basis, when we placed the mines on half time and laid off all our unmarried men.

We have lost some men to the Ford organization at their several plants.

There was a 10% increase in wages placed in effect on May 1st, 1923.

The following statement shows the number of men we could work as compared with the number employed on December 31st, 1923. Viz:

	No. Men Required	No. at Work Dec.31,1923	Shortage	% Short
Miners	120	78	42	35
Trammers	32	14	18	56
Timbermen	22	14	8	36
Skip Tenders	2	2	0	0
Motormen & Brakemen	18	14	4	22
All Others	26	26	0	0
Surface	<u>55</u>	<u>55</u>	<u>0</u>	<u>0</u>
Totals,	275	203	72	26%

The following statement shows the number of men employed each month on surface and underground during the year with previous years for comparison.

Viz:

MEN EMPLOYED

	SURFACE					UNDERGROUND					TOTAL				
	1919	1920	1921	1922	1923	1919	1920	1921	1922	1923	1919	1920	1921	1922	1923
JAN.	49	51	58	53	47	206	232	280	189	165	256	283	338	242	212
FEB.	46	50	61	52	49	206	214	271	193	168	252	264	333	245	217
MAR.	46	45	60	50	50	217	210	301	189	173	263	255	361	239	223
APR.	46	43	53	47	51	213	198	279	198	179	259	241	332	245	230
MAY.	53	54	57	53	58	214	174	272	196	156	267	228	339	249	214
JUN.	50	47	54	53	60	232	186	186	164	148	281	233	240	217	208
JUL.	52	48	51	57	55	214	189	198	153	142	266	237	249	210	197
AUG.	50	46	53	58	57	216	186	209	157	157	266	232	262	215	213
SEP.	49	44	62	60	55	201	190	186	159	153	250	234	248	219	208
OCT.	50	47	61	54	57	205	193	194	157	147	255	240	255	211	203
NOV.	48	46	47	50	58	201	199	194	163	144	249	245	241	213	212
DEC.	51	45	49	51	52	212	246	187	166	143	263	292	236	217	195
AVG.	49	47	55	53	54	214	201	229	174	157	263	248	284	227	210

MORRIS LLOYD MINES.

LABOR
(CONTINUED)

We hope business will be such that during the coming year we can operate on full time and that we may be able to add to our forces.

The average wage rates for each month and year are shown on the following statement with previous years for comparison, viz:

AVERAGE WAGE RATE.

YEAR	SURFACE					UNDERGROUND					TOTAL				
	1919	1920	1921	1922	1923	1919	1920	1921	1922	1923	1919	1920	1921	1922	1923
JAN.	5.15	5.10	5.73	3.87	3.94	5.83	5.82	6.31	4.29	4.32	5.70	5.69	6.18	4.17	4.24
FEB.	5.20	5.60	4.82	3.89	3.97	5.95	6.42	5.30	4.24	4.37	5.81	6.24	5.20	4.15	4.29
MAR.	5.23	5.55	4.82	3.84	3.93	6.01	6.49	5.35	4.24	4.36	5.87	6.31	5.24	4.14	4.26
APR.	5.16	5.60	4.84	3.93	3.93	6.01	6.40	5.16	4.22	4.30	5.85	6.24	5.07	4.16	4.20
MAY.	5.19	5.55	4.79	3.89	4.30	6.02	6.57	5.26	4.23	4.85	5.84	6.33	5.16	4.13	4.67
JUN.	5.16	5.47	4.83	3.61	4.32	6.13	6.62	5.55	3.90	4.83	5.94	6.38	5.39	3.82	4.68
JUL.	5.21	5.32	4.85	3.50	4.30	6.17	6.46	5.55	3.81	4.83	5.97	6.23	5.40	3.72	4.69
AUG.	5.17	5.50	4.32	3.46	4.35	6.03	6.64	4.93	3.84	4.82	5.86	6.38	4.79	3.71	4.70
SEP.	5.20	5.61	4.37	3.93	4.37	6.10	6.47	4.87	4.34	4.79	5.92	6.28	4.73	4.20	4.66
OCT.	5.19	5.65	3.96	3.95	4.36	6.00	6.71	4.44	4.47	4.83	5.85	6.46	4.30	4.33	4.69
NOV.	5.21	5.70	3.92	3.96	4.29	5.86	6.36	4.28	4.39	4.85	5.70	6.20	4.17	4.29	4.68
DEC.	5.18	5.69	3.89	3.73	4.26	5.83	6.26	4.34	4.43	4.88	5.70	6.14	4.21	4.33	4.71
AVG.	5.18	5.46	4.54	3.72	4.12	6.00	6.42	5.26	4.19	4.65	5.84	6.23	5.13	4.08	4.53

The cost per ton for labor, surface, underground and total are shown on the following statement with previous years for comparison, viz:

COST PER TON FOR LABOR.

	SURFACE					UNDERGROUND					TOTAL				
	1919	1920	1921	1922	1923	1919	1920	1921	1922	1923	1919	1920	1921	1922	1923
JAN.	.294	.275	.242	.265	.208	1.363	1.389	1.560	.911	.801	1.657	1.664	1.802	1.176	1.009
FEB.	.279	.319	.211	.247	.217	1.347	1.514	1.274	.891	.873	1.626	1.833	1.485	1.138	1.090
MAR.	.267	.284	.196	.232	.202	1.394	1.465	1.304	.828	.812	1.661	1.749	1.500	1.060	1.014
APR.	.310	.346	.209	.280	.205	1.545	1.589	1.262	.970	.871	1.855	1.935	1.471	1.250	1.076
MAY.	.290	.397	.200	.235	.247	1.320	1.499	1.125	.852	.904	1.610	1.896	1.325	1.183	1.151
JUN.	.251	.327	.369	.183	.188	1.320	1.505	1.586	.723	.740	1.571	1.832	1.925	.906	.928
JUL.	.293	.333	.318	.183	.225	1.374	1.554	1.335	.648	.778	1.667	1.887	1.653	.831	1.003
AUG.	.276	.288	.314	.175	.214	1.374	1.420	1.255	.650	.806	1.650	1.708	1.569	.825	1.020
SEP.	.280	.287	.347	.212	.243	1.267	1.406	1.194	.752	.869	1.547	1.693	1.491	.964	1.112
OCT.	.258	.281	.254	.213	.225	1.217	1.376	.946	.810	.816	1.475	1.657	1.200	1.023	1.041
NOV.	.307	.338	.225	.210	.231	1.389	1.538	.952	.790	.861	1.696	1.876	1.177	1.000	1.092
DEC.	.300	.271	.239	.219	.289	1.333	1.586	.961	.872	.919	1.636	1.857	1.20	1.091	1.208
AVG.	.284	.309	.242	.221	.223	1.354	1.482	1.248	.786	.834	1.638	1.791	1.490	1.000	1.057

MORRIS LLOYD MINES.

LABOR
(CONTINUED)

The following statement shows the number of men of the different nationalities at work in these mines for the month of December 1923, and for the same month during previous years, viz:

	1923	1922	1921	1920	1919	1918	1917
Americans,	0	0	* 0	80	69	60	57
English,	15	16	35	14	14	10	13
Swedish,	16	17	22	9	9	9	10
French,	44	60	53	20	23	10	11
Finnish,	82	89	96	114	96	87	83
Italian,	32	32	22	60	53	45	51
Greeks,	0	0	0	0	0	2	1
Slavish,	0	0	0	2	3	1	0
Norwegian,	2	2	3	0	0	0	0
Irish,	2	0	4	0	0	0	0
Scotch,	2	1	2	0	0	0	0
Austrian,	1	0	0	0	0	0	0
TOTAL,	196	217	237	299	267	224	226

*Basis of Classification changed year 1921.

196/82
785
560

PRODUCTION

During the year we produced 260,335 tons as compared with 221,979 tons last year.

These mines are developed to produce a much larger tonnage.

The production for the year was made of the following grades, viz:

MINE	BESSEMER	MORRIS	SILICA	LLOYD	LLOYDDALE	TOTAL
Morris		132,413	19,290			151,703
Lloyd			5,857	101,145	1,630	108,632
TOTAL, 1923		132,413	25,147	101,145	1,630	260,335
" 1922		109,227	22,850	89,902		221,979
" 1921		68,593	45,529	84,741	171	209,034
" 1920	929	46,643	63,873	105,327	45,000	261,772
" 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

MORRIS LLOYD MINES.

PRODUCTION
(CONTINUED)

We hoisted ore on 295 days at the rate of 882 tons per day.

Three days were lost due to the closing of the mines to conserve water at the power plants and three days were lost on account of a fire, which destroyed our main switch board.

The following statement shows the tons per man per day for each month and the average for the year with previous years for comparison, viz:

TONS PER MAN PER DAY

	SURFACE					UNDERGROUND					TOTAL				
	1919	1920	1921	1922	1923	1919	1920	1921	1922	1923	1919	1920	1921	1922	1923
JAN.	17.66	18.53	22.64	14.37	18.97	4.28	4.19	4.04	4.71	5.39	3.44	3.42	3.43	3.55	4.20
FEB.	18.65	17.54	22.07	15.65	18.42	4.42	4.22	4.16	4.76	5.00	3.57	3.40	3.50	3.65	3.93
MAR.	19.61	19.58	23.72	16.52	19.38	4.31	4.43	4.10	5.11	5.37	3.54	3.61	3.49	3.90	4.20
APR.	16.65	15.85	22.12	14.04	18.68	3.89	4.03	4.08	4.35	4.94	3.16	3.22	3.45	3.32	3.91
MAY.	17.68	13.98	23.48	16.15	16.64	4.57	4.39	4.69	4.97	5.37	3.63	3.34	3.91	3.80	4.06
JUN.	20.40	16.71	13.02	19.13	22.33	4.64	4.40	3.57	5.40	6.52	3.78	3.48	2.80	4.21	5.05
JUL.	17.69	15.98	15.21	18.63	19.01	4.49	4.16	4.16	5.88	6.21	3.58	3.30	3.27	4.47	4.68
AUG.	18.63	18.54	13.73	18.78	19.96	4.39	4.77	3.93	5.90	5.98	3.55	3.73	3.05	4.49	4.60
SEP.	18.70	19.09	12.41	17.77	17.62	4.81	4.61	4.26	5.78	5.51	3.83	3.71	3.17	4.36	4.20
OCT.	20.31	19.45	15.07	18.13	18.89	4.93	4.88	4.70	5.52	5.91	3.97	3.90	3.58	4.23	4.50
NOV.	16.68	16.51	18.32	18.70	18.01	4.22	4.13	4.50	5.56	5.63	3.36	3.31	3.55	4.29	4.29
DEC.	17.29	20.27	15.60	18.17	14.66	4.38	3.95	4.51	5.08	5.31	3.49	3.30	3.50	3.97	3.90
AVG.	18.33	17.67	18.78	17.40	18.47	4.44	4.33	4.22	5.33	5.58	3.57	3.48	3.44	4.08	4.29

It will be noted that the tons per man per day for the current year is the greatest for any year in the history of these properties.

SHIPMENTS

Our shipments for the year were 210,692 tons compared with 293,915 tons last year.

This is very small as compared with the tonnage these mines are prepared to forward. We hope next year will be better.

We continue shipping small tonnages to Charcoal Furnaces and we hope this will continue all during the present winter.

MORRIS LLOYD MINES.

SHIPMENTS
(CONTINUED)

The following statement shows shipments by grades for the past year and previous years for comparison, viz:

SHIPMENTS

YEAR	1918	1919	1920	1921	1922	1923
GRADES	TONS	TONS	TONS	TONS	TONS	TONS
Morris Bessemer,	23,785	5,000	7,789			
Lloyd Bessemer,	2,679					
TOTAL BESSEMER,	26,464	5,000	7,789			
Morris Ore,	13,576	3,613	37,402	7,868	118,858	45,394
Lloyd Ore,	155,166	121,198	111,922	38,582	96,571	80,267
Lloyddale Ore,	60,087	27,699	11,438		42,742	20,390
TOTAL NON BESSEMER,	228,829	152,510	160,762	46,450	258,171	146,051
Morrisville,	11,878	8,506	256	4,620	8,117	39,773
North Lake Silica,	48,369	24,541	31,581	14,780	27,627	24,868
TOTAL SILICA,	60,247	33,047	31,837	19,400	35,744	64,641
GRAND TOTAL,	315,540	190,557	200,388	65,650	293,915	210,692

Of the total shipments for 1923, 85,806 tons were shipped from stock-pile and 124,886 tons from pockets.

ORE IN STOCK

The balances in stockpiles at the end of the year are larger than at the beginning of the year, due to shipments having been less than our production.

The average balance in stock has been creeping up during the past four years and the average is 172% in excess of the average of the previous four years. We hope sales will be made to permit us to clean up these piles during the coming year.

We call attention to the large tonnage of Silica ore being carried.

MORRIS LLOYD MINES.

ORE IN STOCK
(CONTINUED)

Our balances as of December 31, 1923 are as follows: Viz:

BALANCES IN STOCKPILES DECEMBER 31ST, 1923.

	BESSEMER	MORRIS	SILICA	LLOYD	LLOYDDALE	TOTAL
Morris, Lloyd,		137,758	31,985 31,923	132,977	12,417	169,743 177,317
TOTAL, 1923		137,758	63,908	132,977	12,417	347,060
" 1922		65,658	103,835	96,674	31,250	297,417
" 1921		87,371	117,720	90,270	73,992	369,353
" 1920		26,917	91,591	33,840	73,821	226,169
" 1919	10,414	31,975	60,052	22,085	40,259	164,785
" 1918	2,669	10,571	14,203	21,992	23,424	72,859
" 1917	7,261	3,769	32,903	31,006	23,960	98,899
" 1916	61,251	333	37,077	3,866	15,526	118,152

ORE RESERVES

The following statement shows the results in tons, of our development work during the past and previous years.

It will be noted that we continue to develop more ore each year than we mine.

Conditions on our bottom levels indicate we can expect a tonnage greatly in excess of figures as shown for ore "in sight." -

Estimated Ore		1913	1914	1915	1916	1917
In mine Jan. 1st,	Tons	2,861,000	3,218,750	3,089,200	2,081,600	2,575,577
Product,	"	176,080	192,145	221,585	307,685	284,000
Balance,	"	2,684,920	3,026,605	2,867,615	1,773,915	2,291,577
In mine Dec. 31st,	"	**3,218,750	3,089,200	2,081,600	2,575,577	2,267,116
Developed Fiscal Year "		533,830	62,595	** 786,015		** 24,461

Estimated Ore		1918	1919	1920	1921	1922
In mine Jan. 1st,	Tons	2,267,116	2,185,771	2,189,763	2,260,449	3,038,514
Product,	"	289,500	282,483	261,772	209,034	221,979
Balance,	"	1,977,616	1,903,288	1,927,991	2,051,415	2,816,535
In mine Dec. 31st,	"	2,185,771	2,189,763	2,260,449	3,038,514	3,309,174
Developed Fiscal Year "		208,155	286,475	332,458	987,099	492,639

Estimated Ore		1923
In mine Jan. 1st,	Tons	3,309,174
Product,	"	260,335
Balance,	"	3,048,839
In mine Dec. 31st,	"	3,306,270
Developed Fiscal Year "		257,431

** Shows a loss.
** 700,750 tons estimated for Morris Mine.
** Section 6 ore body reduced 603,200 tons.

MORRIS LLOYD MINES.

ESTIMATE OF PRODUCTION

Our Estimate of Production for the coming year, based on our present schedule of operations is: -

300 days at 925 tons per day 277,500 tons.

COSTS OF PRODUCTION

Our costs of production are slightly higher than last year but are still under any other year since 1917.

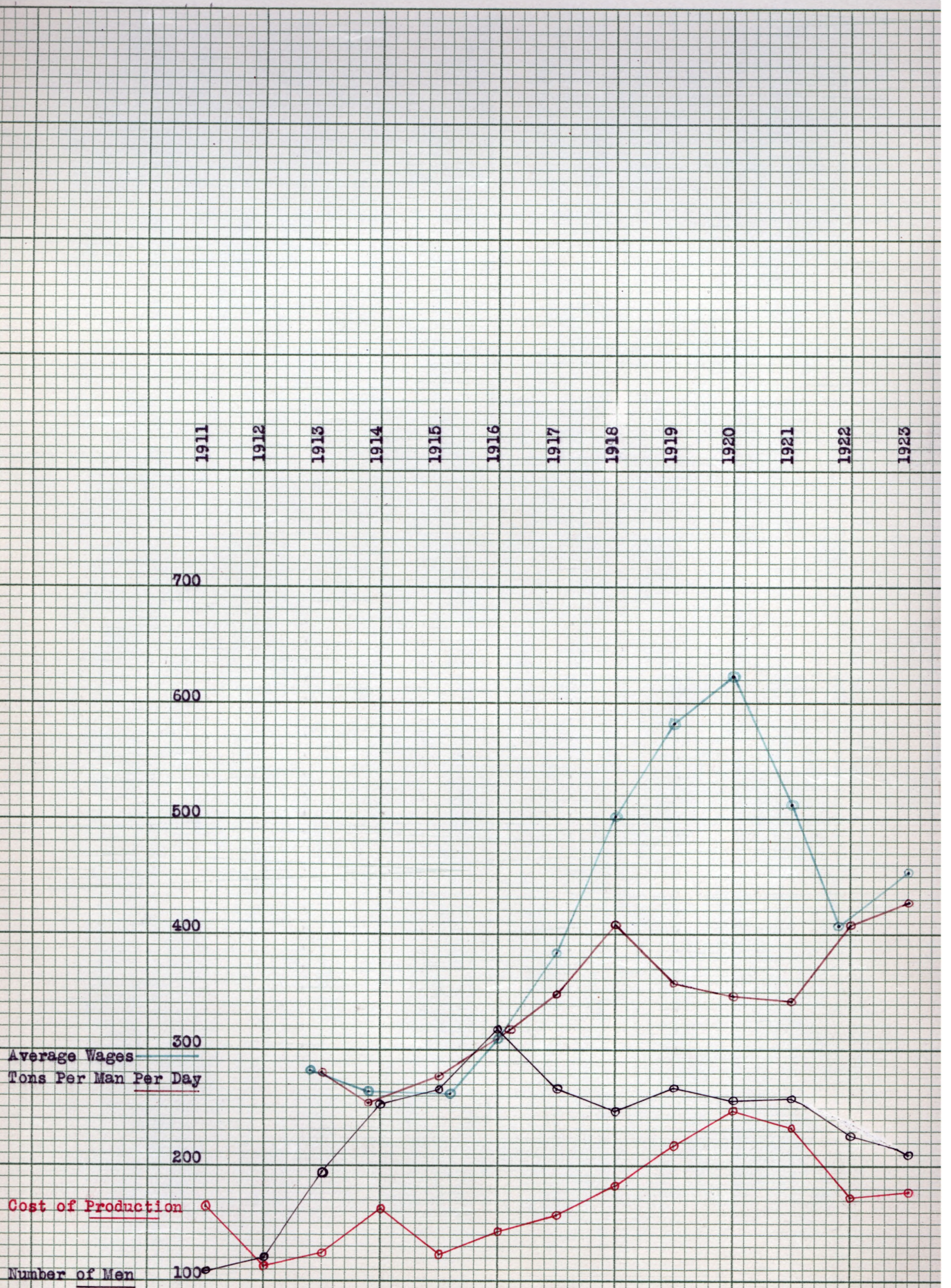
The following table shows -

PRODUCT MONTHLY, PER MAN PER DAY AND COSTS, FOR EACH MONTH
DURING THE PAST YEAR, WITH COMPARISONS FOR PREVIOUS
YEARS, AS PER FIGURES TAKEN FROM COST SHEETS.

1923	PRODUCT TONS	TONS PER MAN PER DAY	COST OF PRODUCTION			COST PER TON		
			LABOR	SUPPLIES	TOTAL	LABOR	SUPP.	TOTAL
JAN.	23,337	4.20	24,093.26	14,683.38	38,776.64	1.243	.629	1.662
FEB.	19,551	3.93	22,043.29	14,456.91	36,500.20	1.126	.739	1.867
MAR.	24,342	4.20	25,460.79	17,293.93	42,754.72	1.046	.711	1.757
APR.	20,914	3.91	23,262.75	15,886.86	39,149.61	1.112	.760	1.872
MAY.	21,728	4.06	25,405.76	16,606.36	42,012.12	1.169	.765	1.934
JUN.	24,546	5.05	22,212.82	13,306.63	35,519.45	.904	.543	1.447
JUL.	21,249	4.68	21,701.25	12,427.81	34,129.06	1.021	.585	1.606
AUG.	24,443	4.60	25,724.10	14,228.47	39,952.57	1.052	.583	1.635
SEP.	20,292	4.20	23,353.73	13,517.54	36,871.27	1.151	.666	1.817
OCT.	22,217	4.50	23,825.42	13,741.30	37,566.72	1.072	.619	1.691
NOV.	19,213	4.29	21,706.42	16,878.14	38,584.56	1.130	.878	2.008
DEC.	18,503	3.90	23,167.35	14,471.42	37,638.77	1.252	.782	2.034
ADJUSTMENT								
TOTAL-1923	260,335	4.29	281,956.94	177,496.75	459,455.69	1.083	.682	1.765
TOTAL-1922	221,979	4.08	226,217.23	155,123.03	381,340.26	1.019	.699	1.718
TOTAL-1921	209,034	3.44	309,782.95	181,881.56	491,664.51	1.482	.870	2.352
TOTAL-1920	261,772	3.48	458,245.96	192,164.29	650,410.25	1.751	.734	2.485
TOTAL-1919	282,483	3.57	438,614.70	173,261.44	611,876.14	1.553	.613	2.166
TOTAL-1918	289,500	4.04	358,003.72	174,378.33	532,382.05	1.237	.602	1.839
TOTAL-1917	284,000	*1-3.48	297,870.77	125,041.62	422,912.39	1.113	.467	1.580
TOTAL-1916	307,685	*2-3.18	257,025.03	139,995.37	397,020.40	.911	.501	1.412
TOTAL-1915	221,585	2.76	178,145.41	97,564.12	275,609.53	.804	.440	1.244
TOTAL-1914	192,145	2.53	193,882.98	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 MINES.

MINE BUILDINGS

All of our mine buildings are in good condition at the close of the year.

A small addition has been made to our change house to care for the larger steam heating boiler which was installed.

New concrete porches were placed around the office to replace old decayed wooden porches.

The large front porch on the Laboratory building was also rebuilt during the year.

MAIN WATER LINE

The main water supply line, leading from the pump in the shop building to the large storage tank, ran underneath the ground used for stockpile purposes and the location was changed during the past summer to a point South of all stocking areas, which removes all possibility of its being broken by weight of ore resting upon it.

DWELLINGS

The first tenant houses built at these mines are showing need of repairs to the under-pinning and will receive attention during the coming year. A large number are also in need of new roofs.

Two houses were shingled during the past summer, one with cedar shingles and one with asbestos shingles, and if the latter come through the winter in good shape we propose using this type of shingle on all work hereafter.

It is recommended that all houses hereafter, if not built of concrete or brick entirely, be at least supplied with concrete walls underneath.

There are fourteen vacant houses in this location at the end of the year compared with eleven at the beginning of the year.

MORRIS LLOYD MINES.

DWELLINGS
(CONTINUED)

No new tenant houses were erected during the year.

During the summer a five foot concrete side walk was laid on both sides of the main street through the location and all of the old decayed wood curbing was replaced with concrete - these items cost a total of \$4,050.50.

The Township of Ishpeming built a rock macadam road from the County Trunk Line M-15 in, to and through our location to the West line of the Township near our office, and in doing so laid a concrete curb and gutter along the main street. Our location now presents the best appearance in its history.

It is proposed to set out maple trees along this main street the coming spring and plant with barberry the two panels near the East end of the location.

A heating plant was installed in house No. 102, occupied by Captain James Stephens, at a cost of \$362.00.

Bath and toilet fixtures were installed in houses Nos. 55 and 45 and additional rental charged to cover the cost.

STORE BUILDING

Our store building was occupied all during the year by Mr. J. B. Casper, who has been the tenant since the building was erected. He moved in January 1st, 1918.

WELFARE WORK

This work has been conducted along the same lines as heretofore.

Prizes are given for best kept premises, etc., and visiting nurse service is being continued.

We allow men to use as much land as they wish, in a large field adjacent to our location, for planting. Few men availed themselves of this privilege during the past year.

MORRIS LLOYD MINES.

WELFARE WORK
(CONTINUED)

Our club house has been open all the year and is quite generally used by our men and their families. Moving pictures are shown on Wednesday and Saturday at a charge of 5¢ for children and 15¢ for adults. There is a small attendance at these pictures.

During the past years the attendance at picture shows has been as follows, viz:

1923	10,076
1922	6,946
1921	10,703
1920	21,768
1919	23,822

The attendance has fallen off due to having so few single men employed in the district. The Finnish people, who constitute 42% of our population, do not generally patronize moving pictures.

A radio outfit was purchased and added to the club house equipment in December month this year.

DOCKS, TRESTLES AND POCKETS

We have been to considerable expense during the year in making additional stocking grounds due to the small shipments.

We moved 11,000 cubic yards of material in order to provide sufficient stocking area. This was done in conjunction with the L. S. & I. Ry., who furnished the locomotive and cars and used the material for ballast on their tracks. We furnished the steam shovel and crew and loaded the material.

We also added a new stocking trestle at the Morris Mine.

TOP TRAM ENGINE AND CARS

This equipment is in good condition and during the year we built a new top tram side dump car and over-hauled and repaired two of the regular saddle back stocking cars.

MORRIS LLOYD MINES.

TRACKS AND YARDS

These are all in good shape and no expense has been necessary during the year.

HOISTING MACHINERY

Our hoists are in fair condition. The Morris Mine hoists are heavily worked and the main shaft and gears will need attention.

Three new hoisting ropes, 5250 feet, were put on during the year at a cost of \$1,386.03.

COMPRESSORS

This equipment is in poor condition and is inadequate for our work. Our air pressure is away below the efficient working point and seriously interferes with our operations.

We recommend that a new air compressor of at least 5000 cubic feet per minute be installed, with pressure capacity of at least 100 pounds.

During the year an air line was laid across on the 6th level of the Morris Mine and up the raise to a connection underground with the Barnes-Hecker Mine.

MINE VENTILATION

We use artificial ventilation on the 7th level of the Morris Mine, only, as all the rest of the mines are kept clear by natural ventilation.

The raise connecting the Barnes-Hecker and Morris Mines make for better ventilation in these properties.

ELECTRIC TRAM EQUIPMENT

The maintenance of this equipment is one of the heaviest expenses we have at these mines. We have such long trams and must employ so many locomotives and cars that a crew of men is kept busy at all times on repairs.

MORRIS LLOYD MINES.

PUMPS

Our pumping equipment is all in good condition except one gear and pinion on No. 2 Prescott Pump. We have the new ones on hand and they will be installed.

The average gallons pumped during the year was 489 gallons compared with 525 G.P.M. last year. In addition we pump about 50 G.P.M. for Domestic water supply from the second level of the Lloyd Mine.

The regular expense for renewal of valves and ordinary repairs were all that were necessary during the year.

The auxiliary pump plant heretofore maintained in the machine shop was moved to and housed in a new building erected between the shop and engine house buildings.

CRUSHING PLANT

No additions were made to this plant during the year and only ordinary repairs were necessary.

This plant adequately serves the Lloyd Mine from which the ore goes directly from the skips to the crusher.

We should have a crusher at our Morris Mine in order to crush the product there and do away with the expense of forwarding the ore to the Maas crushing plant.

A total of 64,283 tons was crushed in this plant during the year at a cost of .031 cents per ton. This cost per ton compares with .166 cents per ton cost at the Maas Crusher.

WATER SUPPLY

There has been no change in this during the year. We continue to get our Domestic water supply from the second level of the Lloyd Mine.

During the year a new gear was placed on the pump used in this work.

MORRIS LLOYD MINES.

MINE TIMBER AND LAGGING

During the first few months of the year the balance of the timber on the surface of the Chase Leases was logged and nothing of value now remains there.

We have had an adequate supply of material at all times during the year.

PERSONAL INJURIES

We take pleasure in again being able to report no fatal accidents for the year just closed. Two serious accidents occurred. On October 19th, John Wirtala suffered a broken pelvis, due to a fall of ground in Contract No. 20, Section Six shaft. He is still confined to the hospital.

On December 17th, Alex Niemie suffered a broken leg, due to a piece of timber falling upon it in Contract No. 26, Morris Mine. He is, of course, still confined to the hospital.

ACCIDENTS TO EQUIPMENT

We have had but one serious accident to equipment during the year. On November 16th, our main switch board burned out and this required four days to repair, during which time the mines were tied up and production lost.

A few hours after the accident occurred a temporary connection was made to get current to our pumps and they were kept operating.

STEAM SHOVEL LOADING

Our shipments from stockpile were very much less than last year and frequent movements of the shovel were necessary in order to make up the mixtures.

We loaded a total of 85,806 tons at a cost of \$.0481 cents per ton.

MORRIS LLOYD MINES.

ROCK DRIFTING

We drifted a total of 2333 feet in rock during the year at a cost of \$9.69 per foot.

Most of this rock work was done on the development of the Chase Leases on the 6th and 7th levels of the Morris Mine.

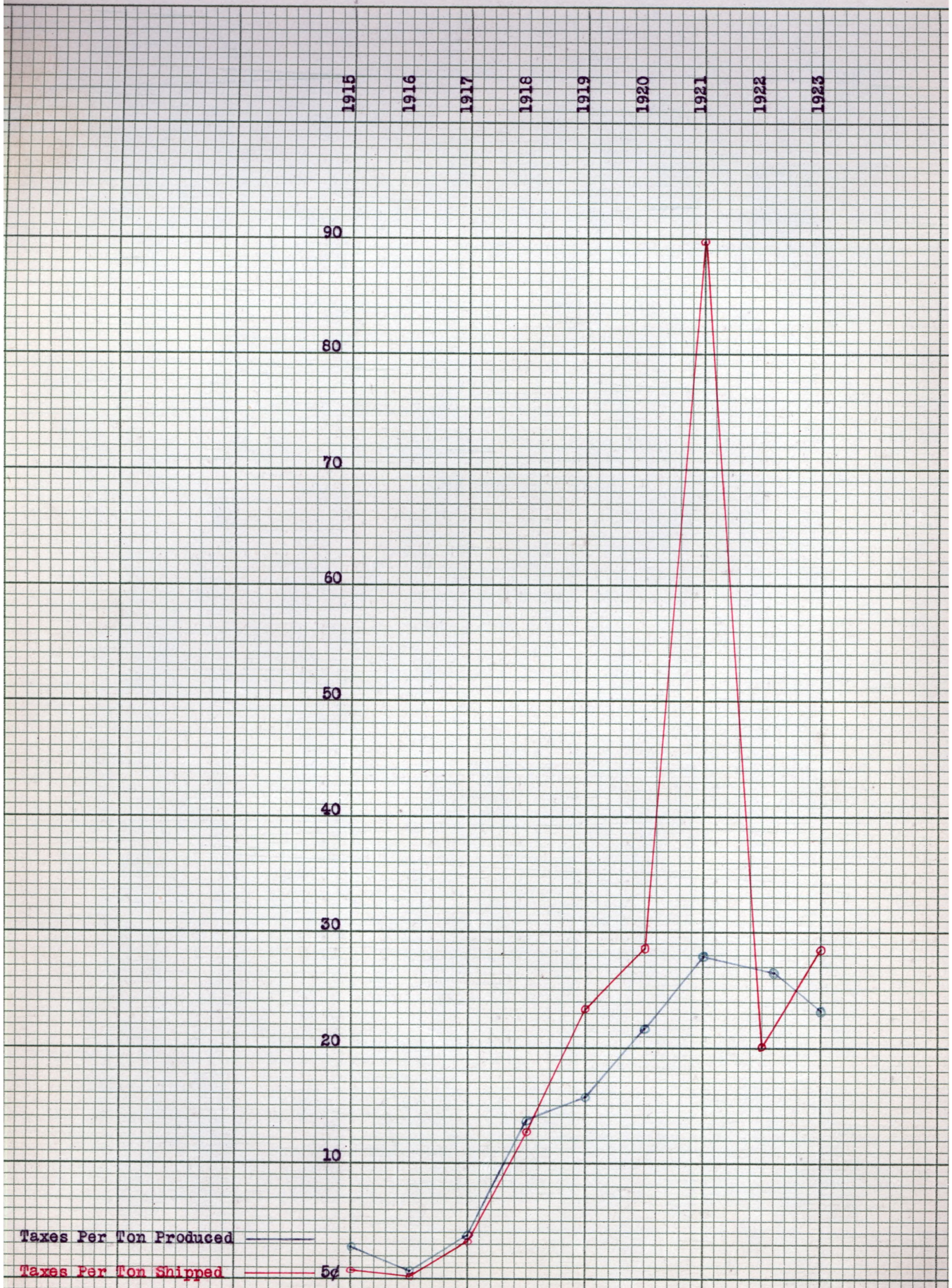
TAXES

The valuations on these mines remained practically unchanged over last year, but the amount of taxes paid are higher, being \$833.90 in excess of 1922.

On account of our larger production this year than last our taxes per ton produced is lower, but on the other hand, due to smaller shipments, our taxes paid per ton shipped are higher.

The following statement shows the valuations, taxes, etc., for the current year and the past three years for comparison, viz:

	1920		1921		1922		1923	
	VALUATION	AMOUNT	VALUATION	AMOUNT	VALUATION	AMOUNT	VALUATION	AMOUNT
LLOYD MINE.								
Realty	877064.00	29882.69	812850.00	26722.27	887662.00	27741.22	869950.00	27168.53
Personal	424884.00	14425.56	543544.00	17758.08	380274.00	11883.65	360500.00	11257.86
Coll. Fees						396.25		384.26
TOTAL LLOYD	1301948.00	44308.25	1356394.00	44480.35	1267936.00	40021.12	1230450.00	38810.65
MORRIS MINE.								
Realty	223590.00	5667.30	341940.00	8139.45	471884.00	11655.49	525540.00	13696.59
Personal	276410.00	6999.24	244000.00	5789.10	296560.00	7325.00	280000.00	7308.00
Coll. Fees						189.80		210.07
TOTAL MORRIS	500000.00	12666.54	585940.00	13928.55	768444.00	19170.29	805540.00	21214.66
GRAND TOTAL,	1801948.00	56974.79	1942334.00	58408.90	2036380.00	59191.41	2035990.00	60025.31
PRODUCT TONS		261,772		209,034		221,979		260,335
TAXES PER TON PRODUCED		.2177		.2794		.2667		.2305
SHPMTS TONS		200,388		65,850		293,915		210,692
TAXES PER TON SHIPPED		.2845		.8670		.2014		.2848



MORRIS LLOYD MINES.

BOILERS

We have installed a 125 H.P. Burt boiler in our Morris main heating plant to replace old boiler worn out.

We have also put in a hot water well and pump to use all the water returning from the heating system. This should cut our coal cost on this operation.

MAYNE LOADERS

During the year we purchased several Mayne Mechanical Loading Machines for work on sub levels.

These are excellent machines, but due to our low pressure, only indifferent results were received.

UNDERGROUND
MORRIS MINE

FOURTH LEVEL:

Slicing and caving in the East ore lens above this level has been underway all the year.

The 810' slice was completed and another slice on the 800' elevation was opened and is being worked at the end of the year.

Ore from here is being mined on both Chase Lease No. 9 and in Fee territory as the line cuts through this ore body.

Some Silica ore remains on the West end of this level but we do not mine any of this grade not encountered in developing or mining the better grades of ore.

A total of 33,681 tons were taken from this territory during the year.

SIXTH LEVEL:

The only exploratory work done on this level during the year was the driving of the rock drift West onto the Barnes Hecker lease and a raise put up which holed into the bottom level of the Barnes-Hecker Mine. This work was all in rock.

MORRIS LLOYD MINES.

UNDERGROUND
MORRIS MINE

SIXTH LEVEL: Continued-

No work has been done on Fee Land and operations were confined to work on the Chase Leases.

The large sub level stope developed above this level on Chase Lease No. 9 has been producing ore all the year and has given us 27% of our entire product. During December month, we have experienced some slabbing of Jasper hanging in this stope, which has compelled us to make a larger percentage of Silica ore.

A total of 68,359 tons were mined from this stope during the year.

During the year the balance of the ore remaining in the stopes on Leases Nos. 24 and 25 was taken and nothing is now being done on same.

Three gangs continue at work in the area West of the large stope on Lease No. 9 and part of this ore body has been developed for sub level stoping.

A total of 109,745 tons were mined from this level during the year.

SEVENTH LEVEL:

This level has been the scene of our most active development work throughout the whole year and operations were kept underway on both day and night shifts until October month, when the night shift was discontinued on account of water shortage at the power plants.

The drift West across the Chase Leases was driven 1600 feet during the year and the opening is now on Chase Lease No. 26.

A number of small ore bodies were cut on this main level drift and they are now being developed.

MORRIS LLOYD MINES.

UNDERGROUND
MORRIS MINE

SEVENTH LEVEL: Continued-

On Lease No. 9, raise No. 61, was put up on the 1930' line through to the 6th level and a sub opened on the 250' elevation, where the ore limits were determined. The ore here shows a length of 350 feet and a width of 90 feet, which is divided by a 20 foot belt of Jasper. Another sub was cut in this same raise on the 300' elevation and a crosscut South driven to test the width of ore which is found to be about 100 feet wide. This ore body lies directly underneath the large sub level stope now being worked above the sixth level and no mining can be done until the ore has been taken above. This is a nice body of ore running high in iron and extends from the 6th down to the 7th level.

Another raise No. 71, was put up in the ore on the 2350' line and a sub opened on the 165' elevation, where the ore area is being determined. It is supposed that this ore lens will continue upwards and connect with the ore body now being mined above the 6th level West of the large sub level stope. The ore on this sub has a width of 60 feet and a length of 125 feet, but is somewhat mixed with Jasper and small dikes.

On the 180' sub, on this same Lease No. 9, South ore body, the ore limit to the North was determined and two raises connected after which one raise was put up and holed through to the 6th level.

On Lease No. 24, raise No. 70 was put up near the 3060' line, 50 feet above the level in a small seam of lean ore and some crosscutting and drifting was done on the 146 foot elevation, but no ore encountered.

Raise No. 62 was put up near the 3100' line to the 217' sub and drifting done to outline the ore body. This work shows up two separate bodies of ore, the one on the North shows a width of 50 feet and has been followed East a distance of 125 feet. It is assumed that this ore body will continue upwards and connect with a small ore body which was mined out on the 6th level.

MORRIS LLOYD MINES.

UNDERGROUND
MORRIS MINE

SEVENTH LEVEL: Continued-

This same sub shows an ore body running Southwest a distance of 180 feet and a drift was put in from the main 7th level running Southwest to open this ore. At the end of the year, this main drift had reached the large dike cutting off the ore at a distance of 130 feet from the main 7th level. This ore body will now be developed for mining.

A raise was put up from the 217' sub on the 3200' line and holed through to the 6th level in rock. This was done to improve ventilation and provide an outlet to the 6th level from this part of the 7th level workings.

Raise No. 63 was put up on the 3435' line just above the level and a sub cut on the 120' elevation and a small body of ore developed. It is supposed this ore body continues upwards and connects with an ore body mined out on the 6th level and to that end, a crosscut from the main 7th level has been driven North to get into this ore on that elevation from which a raise may be put up to develop this ore. At the end of the year this crosscut has just entered the ore.

On lease No. 25, raise No. 64 was put up near the 4700' line to the 148' elevation and a drift driven Southeast for a distance of 50 feet in lean ore. It is supposed that an ore body which was mined out on the 6th level extends downwards to a point somewhere in this area and additional work will be done in an effort to locate it.

Raise no 74 near the 5165' line was started in an ore body cut on the main level, but entered lean material and dike and continued in same for over 100 feet. A sub has been opened and a crosscut South driven, which shows a 35 foot width of ore. The length of the ore will be determined after which raising to the top of the ore will be continued. We have no ore showing on the 6th level above this deposit. We expect this ore body to assume a larger area at lower depth as we have a length of 170 feet of good ore showing on the main 7th level.

MORRIS LLOYD MINES.

UNDERGROUND
MORRIS MINE

SEVENTH LEVEL: Continued-

On Lease No. 26, a length of 200 feet of ore shows on the North side of the main level and a diamond drill hole North horizontally on the 5900' line shows a width of 20 feet of ore and another drill hole near the 6200' line shows a width of 5 feet of ore. Ten foot test holes into this ore were drilled North from the main drift as the latter progressed.

Five small exploring raises were put up from the main level to the West, but the ore was found not to continue upwards any distance. At the end of the year, due to shortage of men no work is being done here, but development work will again be placed underway as soon as possible.

Raise No. 67 was put up above the level on the 6000' line and a cross-cut South driven 100 feet in rich looking Jasper, but no ore was found.

Conditions on this elevation look very favorable for larger ore bodies at greater depth and we consider the situation very promising.

DIAMOND DRILLING

Diamond drilling has been again undertaken and four holes have been drilled horizontally on the West end of the 7th level, Morris Mine.

Hole No. 71 was drilled 225' South without finding any ore. This hole may be continued later as good rich Jasper was encountered.

Hole No. 72 was drilled North from the same set up as No. 71 and this hole cut five feet of ore 55' to 60' from the main drift.

Hole No. 73 was drilled 339 feet South without finding any ore.

No. 74 was drilled North to the footwall from the same set up as No. 73 and cut 20 feet of ore, 20 to 40 feet from the collar.

Drilling is now underway on the 6th level in an effort to locate the downward extension of the ore body now being mined on Lease No. 9 West of the large sub level stope.

MORRIS LLOYD MINES.

UNDERGROUND
LLOYD MINE

THIRD LEVEL:

There is nothing new to report from this central ore body. One sub was mined out during the year and a new sub (1015') opened.

The ore has widened out to an additional area on this new sub, which increases the tonnage figured as remaining in this territory.

This ore area is small and but five gangs of miners are worked. The ground is somewhat harder than the other ore bodies and it is necessary to drill more holes and use more powder to break the ore.

During the year we mined 30,769 tons from this territory.

FOURTH LEVEL:

No work was done on this elevation during the year.

LLOYD EAST

FIRST SUB (1455')

Two gangs developed and are mining two small lenses of ore which were found to run up to the sand above this main sub.

The main ore lens has been all worked above this level and only the two lenses noted above remain and these contain but a small tonnage.

During the year the ore to the West of the shaft remaining on and above this level was taken.

SECOND SUB (1305')

The work of straightening this main sub was completed and eight raises were put up in the ore West of the line of main raises and this block of ore developed for incline slicing. The first or horizontal slice has been taken and the miners have dropped down and are now driving and connecting the raises on the lower elevation, from which the incline slice will be started.

MORRIS LLOYD MINES.

UNDERGROUND
LLOYD EAST

SECOND SUB (1305') Continued-

Slicing and caving is underway in this territory around and to the East of the line of main raises and a good product is being secured.

Two raises are going up in this territory on the West end to take balance of ore remaining above.

THIRD SUB:

A small amount of development work was done in the ore between this and the second main sub preparing the ore body for mining, which will not commence until the ore body has been worked down to the second sub.

The ore body becomes smaller on this elevation.

We mined a total of 77,863 tons from this Lloyd East territory during the year.

LEASES

TONNAGES MINED AND TONNAGES ACCRUED ON LEASES

During the year we have mined as much ore as possible under our curtailed operations and during the period, we have produced in excess of Chase Lease requirements, but are still running behind on Barnes Lease No. 31.

The following statement shows the condition of our royalty account on the different leases, as regards production, in the North Lake District.

NORTH LAKE DISTRICT.

TONNAGES MINED AND TONNAGES ACCRUED ON LEASES.

YEAR	LEASE NO. 9			LEASE NO. 24			LEASE NO. 25		
	ACCRUED	MINED	BALANCE	ACCRUED	MINED	BALANCE	ACCRUED	MINED	BALANCE
1908	2,283								
1909	10,000			1,088			1,088		
1910	10,000			15,000			15,000		
1911	10,000			15,000			15,000		
1912	10,000	968		15,000			15,000		
1913	10,000	15,345		15,000			15,000		
1914	10,000	36,267		15,000			15,000		
1915	10,000	67,740		15,000			15,000		
1916	10,000	68,524		15,000			15,000		
1917	10,000	34,514		15,000	2,569		15,000		
1918	10,000	24,002	145,077	15,000	288	133,231	15,000		136,088
1919	10,000	32,176	167,253	15,000	4,465	143,766	15,000		151,088
1920	10,000	32,907	190,160	15,000	18,707	140,059	15,000	1,481	164,607
1921	10,000	56,794	236,954	15,000	12,075	142,984	15,000	4,843	174,764
1922	10,000	93,170	320,124	15,000	6,752	151,232	15,000	2,052	187,712
1923	10,000	100,777	*410,901	15,000	8,719	157,513	15,000	6,618	196,094
YEAR	LEASE NO. 26			LEASE NO. 27			LEASE NO. 28		
	ACCRUED	MINED	BALANCE	ACCRUED	MINED	BALANCE	ACCRUED	MINED	BALANCE
1909	1,088			1,088			545		
1910	15,000			15,000			7,500		
1911	15,000			15,000			7,500		
1912	15,000			15,000			7,500		
1913	15,000			15,000			7,500		
1914	15,000			15,000			7,500		
1915	15,000			3,750			1,875		
1916	15,000			3,750			1,875		
1917	15,000			15,000			7,500		
1918	7,500		128,588	7,500		106,088	3,750		53,045
1919	13,125		141,713	13,125		119,213	6,563		59,608
1920	15,000	1,292	155,421	15,000		134,213	7,500		67,108
1921	15,000	2,075	168,346	15,000	176	149,037	7,500		74,608
1922	15,000	0	183,346	15,000	0	164,037	7,500		82,108
1923	15,000	1,809	196,537	15,000	0	179,037	7,500		89,608
YEAR	LEASE NO. 31			GRAND TOTAL					
	ACCRUED	MINED	BALANCE	ACCRUED	MINED	BALANCE			
1909									
1910									
1911	70,000								
1912	70,000								
1913	70,000								
1914	70,000								
1915	17,500								
1916	17,500								
1917	70,000								
1918	35,000		420,000			1,082,180	250,217	831,963	
1919	70,000		490,000			1,224,993	286,858	938,135	
1920	70,000		560,000			1,372,493	341,245	1,031,248	
1921	70,000	213	629,787			1,519,993	417,421	1,102,572	
1922	70,000	20,313	679,474			1,667,493	539,708	1,127,785	
1923	70,000	36,228	713,246			1,814,993	693,859	1,121,134	

Tonnages Accrued
 Chase Leases 407,888 Tons
 Barnes-Hecker Lease 713,246 "
 Total, 1,121,134 Tons

* Tonnage Mined in Excess of Requirements

MORRIS LLOYD MINES.

ORE IN SIGHT DECEMBER 31ST, 1923.

Following is an estimate of ore in sight as of December 31st, 1923, calculating a deduction of 10% for rock and 10% for loss in mining, - Viz:

MORRIS MINE

LOCATION OF ORE	BESSEMER ORE	MORRIS ORE	TOTAL TONS
Above 4th Lev. (Chase Lease #9)		17,994	17,994
" " " (C.C.I.Co. Land)		95,416	95,416
" 6th " (Chase Lease #9)		260,868	260,868
" " " (Chase Lease #26)		2,339	2,339
" " " (C.C.I.Co. Land)		145,435	145,435
" 7th " (Chase Lease #9)	49,837	428,199	478,036
" " " (Chase Lease #24)		116,723	116,723
" " " (Chase Lease #26)		8,910	8,910
" " " (C.C.I.Co. Land)	24,283	72,847	97,130
Below " " (Chase Lease #9)	22,609	94,701	117,310
" " " (C.C.I.Co. Land)	15,284	45,852	61,136
<u>PROSPECTIVE ORE</u>			
Above 4th Lev. (C.C.I.Co. Land)		3,164	3,164
" 7th " (Chase Lease #9)		25,608	25,608
" " " (Chase Lease #24)		28,900	28,900
" " " (Chase Lease #25)		6,601	6,601
" " " (Chase Lease #26)		4,809	4,809
" " " (C.C.I.Co. Land)		73,440	73,440
Below " " (Chase Lease #24)		20,377	20,377
" " " (Chase Lease #25)		5,780	5,780
" " " (Chase Lease #26)		10,884	10,884
TOTAL ORE, MORRIS MINE,	112,013	1,468,847	1,580,860

LLOYD MINE

LOCATION OF ORE	LLOYD ORE	LLOYDDATE	TOTAL TONS
Above 3rd Level	135,339		135,339
<u>PROSPECTIVE ORE</u>			
Below 3rd Level	6,185		6,185
TOTAL ORE, LLOYD MINE,	141,524		141,524

MORRIS LLOYD MINES.

ORE IN SIGHT DECEMBER 31ST, 1923
(CONTINUED)

LLOYD EAST

LOCATION OF ORE	LLOYD ORE	LLOYDDALE	TOTAL TONS
Above 1st Main Sub	5,267		5,267
" 2nd " "	125,951	41,660	167,611
" 3rd " "	42,667	219,024	261,711
" 4th " "	10,886	96,050	106,936
Between 3rd Level and 4th Main Sub	28,020	120,774	148,794
Above and below 4th Level, PROSPECTIVE ORE	212,268	636,804	849,072
Above 2nd Main Sub	9,534		9,534
" 3rd " "	2,293	2,293	4,586
" 4th " "	9,113	21,262	30,375
TOTAL ORE, LLOYD EAST,	446,019	1,137,867	1,583,886

SUMMARY OF TOTAL ORE

MINE	BESSEMER	LLOYD & MORRIS	LLOYDDALE	TOTAL TONS
Morris,	112,013	1,468,847		1,580,860
Lloyd,		141,524		141,524
Lloyd East,		446,019	1,137,867	1,583,886
GRAND TOTAL,	112,013	2,056,390	1,137,867	3,306,270

	MORRIS MINE		TOTAL	LLOYD MINE		TOTAL	GRAND TOTAL TONS
	BESSEMER	MORRIS ORE	MORRIS MINE	LLOYD ORE	LLOYDDALE	LLOYD MINE	
Total ore Devel- oped,	112,013	1,289,284	1,401,297	560,418	1,114,312	1,674,730	3,076,027
Total Prospec- tive ore,		179,563	179,563	27,125	23,555	50,680	230,243
TOTAL	112,013	1,468,847	1,580,860	587,543	1,137,867	1,725,410	3,306,270

Total ore on Chase Lease No. 9	699,816 Tons
" " " " " No. 24	166,000 "
" " " " " No. 25	12,381 "
" " " " " No. 26	26,942 "
Total ore on all Chase Leases,	1,105,139 "
Total ore on Company Lands,	2,201,131 "
GRAND TOTAL,	3,306,270 Tons

LLOYD MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR 1923.

GRADE	IRON	PHOS.	SILICA
Lloyd,	59.25	.124	5.99
Lloydedale,	60.52	.177	4.54
Lloyd Silica,	53.49	.093	13.97

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR 1923.

GRADE	IRON	Mine PHOS.	SILICA	Lake Erie	
				IRON	MOIST.
Lloyd,	58.30	.091	-	-	-(**)
Lloydedale,	(All Mixed)				
Lloyd Silica,	50.38	.079	18.12	-	-(**)

NOTE: (**) This represents cargoes, which were only a few, going to the East Jordan Furnace. The bulk of these two grades went in mixed cargoes.

ORE STATEMENT - DECEMBER 31ST, 1923.

	LLOYD	LLOYDDALE	LLOYD SILICA	TOTAL	TOTAL LAST YEAR
On hand January 1,,1923,	96,674	31,250	44,184	172,108	207,133
Output for Year,	101,145	1,630	5,857	108,632	95,354
Transferred,	15,425	73	6,750	22,102	36,561
Total,	213,244	32,807	56,791	302,842	339,048
Shipments,	80,267	20,390	24,868	125,525	166,940
Balance on Hand,	132,977	12,417	31,923	177,317	172,108
Increase in Output,				13,278	
Increase in Ore on Hand,				5,209	

1923 -- 1-8 Hour Shift, Jan. 1st to Dec. 31st, 1923.

1922 -- 1-4 Hour Shift, 6 days per week, Jan. 1st to June 4th, 1922.
1-8 Hour Shift, 6 days per week, June 5th to Dec. 31st, 1922.

LLOYD MINE

SHIPMENTS FOR YEAR-1923.

GRADE	POCKET	STOCKPILE	TOTAL	TOTAL LAST YEAR
Lloyd,	70,603	9,664	80,267	96,571
Lloyddale,	1,604	18,786	20,390	42,742
Lloyd Silica,	8,790	16,078	24,868	27,627
Total,	80,997	44,528	125,525	166,940
Total Last Year,	78,214	88,726	166,940	
Decrease,			41,415	

MORRIS MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR 1923.

GRADE	IRON	PHOS.	SILICA
Morris Bessemer,	(No Production)		
Morris,	58.15	.072	7.70
Morrisville,	51.71	.068	17.18

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR 1923.

GRADE	Mine IRON	PHOS.	SILICA	Lake Erie IRON	MOIST.
Morris Bessemer,	(No Shipments)				
Morris,	57.50	.105	-	-	-(**)
Morrisville,	(All Mixed)				

NOTE: (**) This represents two cargoes going to East Jordan Furnace. Balance of cargoe shipments, this grade, went mixed.

ORE STATEMENT - DECEMBER 31ST, 1923.

	MORRIS BESSEMER	MORRIS	MORRISVILLE	TOTAL	TOTAL LAST YEAR
On hand January 1, 1923,	-	65,658	59,651	125,309	162,220
Output for Year,	-	132,413	19,290	151,703	126,625
Transferred,	-	14,919	7,183	22,102	36,561
Total,	-	183,152	71,758	254,910	252,284
Shipments	-	45,394	39,773	85,167	126,975
Balance on Hand,	-	137,758	31,985	169,743	125,309
Increase in Output,				25,078	
Increase in Ore on Hand,				44,434	

1923 -- 1-8 Hour Shift, Jan. 1st to Dec. 31st, 1923.

1922 -- 1-4 Hour Shift, 6 days per week, Jan. 1st to June 4th, 1922.
1-8 Hour Shift, 6 days per week, June 4th to Dec. 31st, 1922.

MORRIS MINE
SHIPMENTS FOR YEAR-1923

GRADE	POCKET	STOCKPILE	TOTAL	TOTAL LAST YEAR
Morris Bessemer,	-	-	-	-
Morris,	42,895	2,499	45,394	118,858
Morrisville,	995	38,778	39,773	8,117
Total,	43,890	41,277	85,167	126,975
Total Last Year,	52,335	74,640	126,975	
Decrease,			41,808	

MORRIS-LLOYD MINE

COMPARATIVE MINING COST FOR YEAR

	1923	1922	INCREASE	DECREASE
PRODUCT	260,335	221,979	38,356	
Underground Costs	1.400	1.345	.055	
Surface Costs	.236	.230	.006	
General Mine Accounts	.129	.143		.014
Cost of Production	1.765	1.718	.047	
Original Cost	.032	.032		
Plant Account	.263	.262	.001	
Extraordinary Drifting	.009		.009	
Taxes	.231	.267		.036
Central Office	.076	.085		.009
Contingent Expense	.030	.041		.011
Cost Adjustment	.026	.017	.009	
Cost on Stockpile	2.432	2.422	.010	
Loading & Shipping	.060	.076		.016
Total Cost on Cars	2.492	2.498		.006
No. Days Operating	295	301		6
No. Shifts & Hours	1-8	1-4-129 1-8-172		
Avg. Daily Product	882	737	145	
<u>COST OF PRODUCTION</u>				
Labor	1.083	1.019	.064	
Supplies	.682	.699		.017
Total	1.765	1.718	.047	

MORRIS-LLOYD MINE

COMPARATIVE WAGES AND PRODUCT

	1 9 2 3	1 9 2 2	INCREASE	DECREASE
PRODUCT	260,335	221,979	38,356	
No.Shifts & Hours	1-8hr	1-4;1-8		
AVG.NO.MEN WORKING				
Surface	46	47		1
Underground	156	174		18
Total	202	321		19
AVG.WAGES PER DAY				
Surface	4.12	3.72	.50-12 %	
Underground	4.65	4.19	.46-10 %	
Total	4.53	4.08	.45-10 %	
WAGES PER MO.of 25 DAYS				
Surface	103.00	93.00	10.00	
Underground	116.25	104.75	11.50	
Total	113.25	102.00	11.25	
PRODUCT PER MAN PER DAY				
Surface	18.48	17.40	1.08	
Underground	5.58	5.33	.25	
Total	4.29	4.08	.21	
LABOR COST PER TON				
Surface	.223	.214	.009	
Underground	.834	.786	.048	
Total	1.057	1.000	.057	
AVG.PRODUCT BRK'G & TRM'G	10.05	8.85	1.20	
" WAGES CONTRACT MINERS	4.83	4.41	.42	
" " "	4.83	4.41	.42	
TOTAL NO.OF DAYS				
Surface	14,083	12,715 $\frac{1}{4}$	1,367- $\frac{3}{4}$	
Underground	46,666 $\frac{1}{4}$	41,618 $\frac{1}{4}$	5,048	
Total	60,749 $\frac{1}{4}$	54,333 $\frac{1}{2}$	6,415- $\frac{3}{4}$	
AMOUNT FOR LABOR				
Surface	58007.55	47387.29	10620.26	
Underground	217099.94	174481.44	42618.50	
Total	275107.49	221868.73	53238.76	

Proportion Surface to Underground Men:

- 1923 - 1 to 3.4
- 1922 - 1 to 3.7
- 1921 - 1 to 4.9
- 1920 - 1 to 4.4
- 1919 - 1 to 4.4

MORRIS-LLOYD MINE

TIMBER STATEMENT FOR THE YEAR ENDING DECEMBER 31, 1923.

KIND	LINEAL FEET	AVG. PRICE PER FOOT	AMOUNT 1923	AMOUNT 1922
6" to 8" Timber	106,005	.0393	4,160.41	1,881.59
8" to 10" "	48,232	.0654	3,155.63	2,876.01
10" to 12" "	28,048	.0798	2,239.73	2,395.30
12" to 14" "	6,640	.0944	626.85	
Total Timber - 1923	188,925	.0539	10,182.62	7,152.90
" " 1922	155,222	.0461		7,152.90
5' Lagging	LINEAL FEET	PER 100'		
5' Lagging	150,875	.77	1,162.46	1,663.51
8' "	261,246	.661	1,726.48	687.30
Total Lagging	412,121	.701	2,888.94	2,350.81
3" Poles	114,239	.912	1,042.52	1,720.15
Total Lagging & Poles	526,360	.746	3,931.46	4,070.96
Do 1922	531,380	.766		4,070.96
5/8" Covering Boards	76,219	1.435	1,093.08	512.00
Product			260,335	221,979
Feet of timber per ton of ore			.726	.699
" " lagging "			1.58	1.60
" " " per foot of timber			2.18	2.29
Cost per ton for timber			.0391	.0322
" " " " covering boards			.0042	.002
" " " " lagging			.0111	.011
" " " " poles			.0041	.008
" " " " timber, boards, lagging & poles			.0585	.0532
Equivalent of stull timber to Bd. measure			291,973	227,301
Feet of board measure per ton of ore			1.122	1.02
Cost of timber, lagging and poles - 1923				15,207.16
1922				11,735.86
1921				19,348.78
1920				19,177.57
1919				17,277.93
1918				15,676.42
1917				19,623.30
1916				20,682.74

MORRIS-LLOYD MINE

STATEMENT OF EXPLOSIVES USED FOR BREAKING ORE

KIND	QUANTITY	AVERAGE PRICE	AMOUNT 1925	AMOUNT 1922
40% Powder	156,090	.1339	20,892.64	18,216.50
60% "	10,300	.1682	1,732.28	1,505.18
Total Powder	166,390	.1360	22,624.92	19,721.68
Fuse	437,100	6.38	2,787.03	2,465.24
Caps	80,700	11.44	923.00	711.54
Tamping Bags	20,000	2.15	43.00	43.21
Cap Crimpers	30	.47	13.92	26.77
Total Fuse, Etc.			3,766.95	3,246.76
Total Explosives			26,391.87	22,968.44
Product			260,335	221,979
Pounds Powder per ton of Ore			.639	.609
Cost per ton for Powder			.087	.089
" " " " Fuse, Etc.			.014	.014
" " " " All Explosives			.101	.103
Average price per pound for Powder			.136	.146

BARNES HECKER MINE.

GENERAL

This mine has been operated all the year. From January 1st to February 19th, work went forward on both day and night shifts, but due to shortage of men operations have been confined to days only since that time. We have not a sufficient number of men to crowd the work even on one shift.

No new work was undertaken on surface at this mine during the year.

The initial shipment, consisting of 17,019 tons Silica ore, went forward from this property during the latter part of the season.

A pumping plant is still maintained to keep the North Lake bottom clear of water. There are a large number of springs on both the bottom and banks, which produce a considerable flow.

The flow of water in the mine is now approximately 660 gallons per minute. The ground above the first level has drained completely and no difficulty from water is experienced in our mining.

The 3rd level was extended East to a point where it met the raise coming up from the 6th level of the Morris Mine. This opening gives us a second outlet from this property as well as tending to improve the ventilation.

We find the ore body in this property to be badly mixed, and it appears that we will have great difficulty in making a high grade product in the lenses above the 2nd level. We have cut some very good ore on the bottom level which seems to be cleaner than that found above.

From present outlook it appears that the prospects of finding good ore in large quantities at depth are very encouraging.

We are greatly handicapped in developing this property on account of the insufficient number and low efficiency of men. We are short of miners, but seem to have no difficulty in getting other labor.

BARNES HECKER MINE.

GENERAL
(CONTINUED)

During the year the following tonnages were produced, viz:

Non Bessemer Ore,	23,742	Tons
Silica Ore,	<u>12,486</u>	"
Total,	36,228	Tons

At the end of the year royalties have accrued on ore amounting to 713,246 tons.

ACCIDENTS

We are pleased to again be able to report that no fatal or serious accidents occurred at this property during the year.

ACCIDENTS TO EQUIPMENT

The equipment is all new at this mine and not being worked to capacity, practically no trouble was experienced.

In October month, while a new gear was being placed on the Aldrich Pump, to replace the belt drive, the motor burnt out on the auxiliary Centrifugal Pump and we were compelled to discontinue operations and use our bailers to keep the mine clear of water while repairs were being made.

UNDERGROUND

FIRST LEVEL:

This main level was driven East to the 7650' line and a raise put up 150' above the level near surface drill hole No. 49. Excellent ore, running 60% and over in iron is being opened for mining at this elevation at the close of the year.

A sub was cut at the 1000' elevation from above raise and a crosscut driven South a distance of 95 feet. This crosscut encountered a small run of ore near the raise and was in Jasper the balance.

BARNES HECKER MINE.

UNDERGROUND

FIRST LEVEL: Continued-

A drift West in the seam of ore was started and this continued in ore for 230 feet and two crosscuts were driven South to test the width of the ore, which was found to be about 60 feet wide.

The main level has been extended Southeast and East to get under this ore body. Three raises are going up from this South main drift to develop the territory for mining. The ground is badly mixed.

Two gangs have been slicing in the West ore lens above this level and have taken the first slice on the 1100' elevation and have dropped down and are now on the second slice. The ground stands vertical and is very heavy and a number of runs have been experienced. We expect we will get away from this trouble as soon as we get a good job started.

We have four additional gangs slicing and caving in small lenses of ore above this first main level. The ground is badly mixed and we have difficulty in making a merchantable product.

SECOND LEVEL:

Raise No. 38 on the East end of this level was put up in lean material and a sub, 890', put in to the North which shows 20 feet of good ore.

There are a total of eight raises put in to the top of the ore from this main second level all of them in more or less mixed material. One of these raises, No. 31, went through to the 1st level in ore.

Due to labor shortage, no work is now being done on this level, the work being confined to the area at the top of the ore bodies above the first level.

THIRD LEVEL:

This main level was driven a distance of 360 feet during the year and a connection made with the raise coming up from the Morris Mine.

BARNES HECKER MINE.

UNDERGROUND

THIRD LEVEL: Continued-

This drift encountered 150 feet of ore, but the last 90 feet is in Jasper.

Raise No. 70 was completed through to the 2nd level during the year and with the exception of the first 80 feet has all been in ore.

No. 72 raise is now going up in excellent ore and at the end of the year is 160 feet above the main level. This ore will apparently extend through and beyond the elevation of the 2nd level. The opening of this second level does not extend East to the point where this raise will come up. The level will be extended and it is hoped a large body of ore may be developed on the East end.

It is quite possible that this ore lens will go on up to the ore now being mined on the first level. None of the raises put up on the second level got up far in ore and it is just possible that there is ore to the East that makes up.

The cutting of this strong body of good ore on this 3rd level changes the whole aspect of this property and adds greatly to its possibilities.

It has always been supposed that we had two lenses of ore - one going up to the East and one to the West, converging on this 3rd level. It now appears that we may reasonably expect a much larger and cleaner ore body at greater depth.

Inasmuch as the 6th level of the Morris Mine has been extended and the West end is now on this Barnes-Hecker lease at an elevation of about 200 feet below this bottom level in the Barnes-Hecker Mine, we recommend that this 6th level be extended West and diamond drilling put underway to explore the territory.

BARNES HECKER MINE.

UNDERGROUND

THIRD LEVEL: Continued-

Geological conditions are most favorable for ore in this territory as a large fault, which throws the footwall to the North, has been proven and a very rich formation is shown.

ORE IN SIGHT

An estimate has been made of the ore in sight as shown by our present development and this shows a total of 462,963 tons.

We expect further development will increase these figures.

BARNES-HECKER MINE

AVERAGE MINE ANALYSIS ON OUTPUT FOR YEAR 1923.

GRADE	IRON	PHOS.	SILICA
Barnes,	58.03	.087	7.58
Barnes Silica,	52.50	.080	15.01

AVERAGE ANALYSIS ON STRAIGHT CARGOES FOR YEAR 1923.

GRADE	Mine IRON	PHOS.	SILICA	Lake Erie IRON	MOIST.
Barnes,	(No Shipments)				
Barnes Silica,	(All Mixed)				

ORE STATEMENT - DECEMBER 31ST, 1923.

	BARNES	BARNES SILICA	TOTAL	TOTAL LAST YEAR
On hand January 1, 1923,	13,834	6,692	20,526	213
Output for Year,	23,742	12,486	36,228	20,313
Total, Shipments,	37,576	19,178	56,754	20,526
		-	17,019	-
Balance on Hand,	37,576	2,159	39,735	20,526
Increase in Output,			15,915	
Increase in Ore on Hand,			19,209	

1923 -- 2-8 Hour Shifts, Jan. 1st to Feb. 18th, 1923.
1-8 Hour Shift, Feb. 19th to Dec. 31st, 1923.

1922 -- 1-8 Hour Shift, Jan. 1st to June 4th, 1922.
2-8 Hour Shifts, June 5th to Dec. 31st, 1922.

BARNES-HECKER MINE
SHIPMENTS FOR YEAR-1923.

GRADE	POCKET	STOCKPILE	TOTAL	TOTAL LAST YEAR
Barnes,	-	-	-	-
Barnes Silica,	2,834	14,185	17,019	-
Total,	2,834	14,185	17,019	-
Increase,			17,019	

BARNES-HECKER MINE

COMPARATIVE MINING COST FOR YEAR

	1923	1922	INCREASE	DECREASE
PRODUCT	36,228	20,526	15,702	
Underground Costs	3.805	3,387	.418	
Surface Costs	.496	.136	.360	
General Mine Accounts	.288	.096	.192	
Cost of Production	4.589	3.619	.970	
Construction Cost	1.194		1.194	
Taxes	.103	.018	.085	
Central Office	.160	.058	.102	
Contingent Expense	.060	.025	.035	
Cost Adjustment	.016	.010	.006	
Cost on Stockpile	6.122	3.730	2.392	
Loading & Shipping	.025		.025	
Total Cost on Cars	6.147	3.730	2.417	
No. Days Operating	296	48	248	
No. Shifts & Hours	2-8-41 1-8-255	2-8hr		
Avg. Daily Product	122	428		306
<u>COST OF PRODUCTION</u>				
Labor	2.260	.818	1.442	
Supplies	2.329	.728	1.601	
Ore Produced in Development	0	2.073		2.073
Total	4.589	3.619	.970	

NOTE: MINE started on operating basis Nov. 1, 1922. 2-8hr 6 days week.

BARNES-HECKER MINE

COMPARATIVE WAGES AND PRODUCT

	1 9 2 3	1 9 2 2	INCREASE	DECREASE
PRODUCT	362,228	20,313	15,915	
No.Shifts & Hours	2-8:1-8	2-8hr		
AVG.NO.MEN WORKING				
Surface	19	20		1
Underground	37	54		17
Total	56	74		18
AVG.WAGES PER DAY				
Surface	4.20	3.86	.34-8.1%	
Underground	4.68	4.46	.22-4.7%	
Total	4.52	4.29	.23-5.1%	
AVG.WAGES PER MO. OF 25 DAYS				
Surface	105.00	96.50	8.50	
Underground	117.00	111.50	5.50	
Total	113.00	107.50	5.50	
PRODUCT PER MAN PER DAY				
Surface	6.10	19.16		13.06
Underground	3.17	7.64		4.48
Total	2.09	5.46		3.37
LABOR COST PER TON				
Surface	.688	.202	.486	
Underground	1.478	.584	.894	
Total	2.166	.786	1.380	
AVG.PRODUCT BRK'G & TRM'G	10.72			
" WAGES MINERS	4.95			
" " TRAMMERS	4.25			
" " BRK & TRM	4.50			
TOTAL NO.OF DAYS				
Surface	5,936	1,060 $\frac{1}{4}$	4,875- $\frac{3}{4}$	
Underground	11,427- $\frac{3}{4}$	2,660 $\frac{1}{2}$	8,767 $\frac{1}{4}$	
Total	17,363- $\frac{3}{4}$	3,720- $\frac{3}{4}$	13,643	
AMOUNT FOR LABOR				
Surface	24929.49	4094.02	20835.47	
Underground	53534.38	11868.35	41666.03	
Total	78463.87	15962.37	62501.50	

Proportion Surface to Underground Men:
 1923 - 1 to 2
 1922 - 1 to 2.7

BARNES-HECKER MINE

TIMBER STATEMENT FOR THE YEAR ENDING DECEMBER 31, 1923.

KIND	LINEAL FEET	AVG. PRICE PER FOOT	AMOUNT 1923	AMOUNT 1922
6" to 8" Timber	75,623	.0352	2,666.61	901.16
8" to 10" "	28,552	.0675	1,927.21	110.38
10" to 12" "	3,212	.0909	291.99	32.48
12" to 14" "	2,338	.125	292.02	221.31
14" to 16" "	1,228	.132	162.70	75.49
16" to 18" "	164	.132	21.65	16.03
Total Timber	111,117	.0483	5,362.18	1,356.85
	LINEAL FEET	PER 100'		
5' Lagging	273,700	.746	2,043.36	647.50
8' "	64,060	.729	466.76	33.88
Total Lagging	337,760	.743	2,510.12	681.38
Poles	60,662	1.042	632.55	41.92
Total Lagging & Poles	398,422	.788	3,142.67	723.30
5/8" Covering Boards	20,042	1.650	330.73	-
Product			36,228	7,016
Feet of timber per ton of ore			3.067	5.119
" " lagging "			9.323	12.318
" " " per foot of timber			3.03	2.406
Cost per ton for timber			.148	.193
" " " " lagging			.069	.097
" " " " poles			.018	.005
" " " " covering boards			.009	-
" " " " timber, lagging, poles & boards			.244	.296
Equivalent of stull timber to board measure			164,685	57,047
Feet of board measure per ton of ore			4.545	8.130
Cost for timber, lagging and poles - 1923				8,835.58
1922				2,080.15

Mine on operating basis Nov. 1st, 1922 - 2 - 8 hr. shifts
 Jan. 1st, 1923, to Feb. 19th, 1923 - 2 - 8 hr. shifts
 Feb. 19th, 1923, to Dec. 31st, 1923, 1 - 8 hr. shift.

BARNES-HECKER MINE

STATEMENT OF EXPLOSIVES USED FOR BREAKING ORE

KIND	QUANTITY	AVERAGE PRICE	AMOUNT 1923	AMOUNT 1922
40% L. F. Powder	22,650	.1359	3,034.08	722.17
60% Gelatin "	500	.1725	86.25	0
Total Powder	23,150	.1348	3,120.33	722.17
Fuse	111,150	6.48	720.47	151.41
Caps	17,650	11.48	202.72	42.46
Cap Crimpers	13	.39	5.03	.60
Tamping Bags	500	1.95	.97	0
Total Fuse, Etc.			929.19	194.47
Total All Explosives			4,049.52	916.64
Product			36,228	7,016
Pounds Powder per ton of Ore			.639	.769
Cost per ton for Powder			.086	.103
" " " " Fuse, Caps, Etc.			.025	.028
" " " " All Explosives			.111	.131
Average price per pound for Powder			.134	.133

Mine on operating basis Nov. 1st, 1922 - 2 - 8 hr. shifts
 Jan. 1st, 1923 to Feb. 19th, 1923 - 2 - 8 hr. shifts
 Feb. 19th, 1923 to Dec. 31st, 1923 - 1 - 8 hr. shift.

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, 1923.

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

GENERAL REMARKS
AUSTIN MINE
STEPHENSON MINE
FRANCIS MINE
GWINN MINE
PRINCETON MINE
GARDNER AND MACKINAW MINES
GENERAL SURFACE.

GENERAL REMARKS

The product of the Gwinn District Mines for the years 1923 and 1922, was as follows:

	<u>1923</u>	<u>1922</u>	<u>INCREASE</u>
Stephenson Mine,	247,212	213,223	33,989
Austin "	82,976	50,905	32,071
Francis "	<u>110,550</u>	<u>98,049</u>	<u>12,501</u>
	440,738	362,177	
INCREASE, 1923,			78,562

The following table gives shipments for 1923, and ore in stock on December 31st, 1923:

	<u>SHIPPED</u>	<u>IN STOCK DEC. 31, 1923</u>
Stephenson Mine,	74,368	413,209 tons
Austin "	94,553	43,233 "
Francis "	0	364,004 "
Princeton "	25,642	191,747 "
Gwinn "	28,529	7,454 "
Gardner-Mackinaw Mine,	<u>10,264</u>	<u>50,562 "</u>
	233,356	
Ore in stock December 31st, 1923,		1,070,209 "
Ore in stock December 31st, 1922,		835,493 "
INCREASE - 1923,		234,716 "

The Stephenson and Francis Mines operated all the year, the Austin Mine from January 1st to November 19th. The Gwinn, Princeton and Gardner-Mackinaw Mines were idle the entire year. Water has been pumped at the Gwinn and Princeton Mines, and all the main levels kept in repair. The Gardner-Mackinaw Mine was kept unwatered until it was decided to pull the pumps the last of November. As the ore at this mine is hard and there is comparatively little timber, water would not damage the underground openings and as the incoming water was only 106 gallons per minute, it would not be a difficult task to unwater it

when the mine resumed operations. It will be at least four months before the mine is filled with water.

The total product of the Gwinn District Mines, since the company started operations here in 1903, is 7,632,344 tons.

There has been no labor shortage during the past year. There has been a surplus of surface labor, representing largely the sons of employes. This surplus has gone to the automobile plants in Lansing, Detroit and Flint, and to the new Ford industries at Iron Mountain and L'Anse. Some men were laid off when the Austin Mine closed down, but the miners were given employment at the Francis and Stephenson Mines. The surface labor employed at the District Crushing Plant and for loading by steam shovel were laid off and most of the men have left the district to find employment in the cities.

On January 1st, 1923, there were 452 men employed in the district, on December 31st, 1923, there were 400, the decrease for the year being 52. On January 1st, 1922, there were 422 employed, so that the number now employed is less than two years ago.

For the first time in several years there are vacant company houses at Gwinn Townsite and at the Austin and Princeton Locations. Only four houses at the Gardner-Mackinaw were occupied at the end of the year. Due to the decreased program of work at the mines, the population is gradually decreasing.

The Company very generously deeded to Marquette County a small tract of land East of Gwinn, on the East Branch of the Escanaba River, as a County Park site. Work of improving this tract was started in August and continued until early in December. It has been fenced and partially cleared of under-brush, dead timber, etc. The low ground has been ditched, roads tentatively located, camping sites selected, and a general improvement program decided on. The park should be opened to the public next summer and will undoubtedly prove very popular both to Marquette County residents and to tourists.

The Austin School, a four-room building, caught fire on the night of December 13th, and burned to the ground. The building was covered by

insurance, but it was not enough to cover the cost of rebuilding. Work of rebuilding was started immediately and good progress is being made. The School Board decided to rebuild with day labor, sufficient of which was available, without interfering with the operation of the mines. The fire evidently caught from a spark lodged in the belfry and gained good headway before it was discovered. Temporary schools were opened three days after the fire, part of the children going to the Princeton town hall, the balance to the basement of the Methodist Church at Gwinn.

AUSTIN MINE

The Austin Mine operated on double shift from January 1st to July 1st, and on single shift from July 1st to November 19th, when it closed down for the winter.

The product by months for the year was as follows:

January,	8,400 tons	July,	5,954 tons
February,	6,944 "	August,	8,153 "
March,	8,108 "	September,	7,790 "
April,	8,450 "	October,	6,965 "
May,	10,504 "	November,	<u>1,902 "</u>
June,	9,268 "		
		Total Ore,	62,438 "
		Rock,	<u>10,730 "</u>
		Total Ore & Rock,	93,168 "

The largest product was obtained in May, the smallest was in November, in which month ore was hoisted on eleven days only, hoisting operations being transferred from No. 1 to No. 2 Shaft between November 7th and November 14th, during which time no ore was hoisted. The mine was closed for the winter on November 19th. A low product was also obtained in July, when the change was made from double to single shift, due to work of retimbering old drifts in order to start new working places.

The following table shows the product and shipments by years since the Austin Mine was opened in 1903:

<u>YEAR</u>	<u>PRODUCT</u>	<u>SHIPMENTS</u>	<u>YEAR</u>	<u>PRODUCT</u>	<u>SHIPMENTS</u>
1903	1,086	0	1914	0	30,491
1904	30,118	0	1915	0	0
1905	57,210	44,653	1916	16,193	64,521
1906	160,049	173,182	1917	51,659	44,420
1907	192,424	195,950	1918	1,069	8,533
1908	197,525	111,229	1919	14,896	2,334
1909	203,129	125,727	1920	73	3,665
1910	64,705	188,587	1921	0	0
1911	145,221	107,394	1922	50,905	5,065
1912	115,934	102,529	1923	<u>82,976</u>	<u>94,553</u>
1913	68,259	107,365		<u>1,453,431</u>	<u>1,410,198</u>

On Hand, 43,233

It is estimated that there are approximately 100,000 tons remaining in the shaft pillar. Adding this to the total product to date shows that the total production from the Austin Mine will eventually be approximately 1,550,000 tons.

The ore statement showing the amount on hand January 1st, 1923, the output for the year, shipments and the amount of ore on hand December 31st, 1923, is as follows:

	<u>AUSTIN BESS.</u>	<u>AUSTIN</u>	<u>AUSTIN- PORT</u>	<u>AUSTIN- WOOD</u>	<u>TOTAL</u>
On Hand, Jan. 1st, 1923,	24,154	0	30,656	0	54,810
Output for year (includes transfers and overruns)	<u>7,139</u>	<u>14,814</u>	<u>58,351</u>	<u>2,672</u>	<u>82,976</u>
Total,	31,293	14,814	89,007	2,672	137,786
Shipments,	<u>30,937</u>	<u>14,814</u>	<u>48,802</u>		<u>94,553</u>
In Stock Dec. 31, 1923,	356	0	40,205	2,672	43,233

A new grade of ore was produced in 1923, called "Austinwood". It is a high-phosphorus ore, running over 1.2% in phosphorus, a small quantity of which was found on some of the sub-levels near the footwall. It could not be included in the "Austinport" product, as it raised the phosphorus above the limit for this grade. Fortunately, only a small tonnage of this ore was found so that the total product of this grade was only 2,672 tons.

The ore in sight on December 31st, 1923, was as follows:

	<u>AUSTIN BESSEMER</u>	<u>AUSTIN</u>	<u>AUSTINPORT</u>	<u>TOTAL</u>
Ore above 1st Level,	6,356	1,590	7,946	15,892
" " 2nd "	24,227	6,056	15,142	45,425
" " 3rd "	<u>11,429</u>	<u>2,857</u>	<u>14,285</u>	<u>28,571</u>
Totals,	42,012	10,503	37,373	89,888

The estimate shows a decrease of 46,994 tons as compared with the estimate of the previous year. Allowing for the product of 1923, there were 35,444 tons developed during 1923. This represents largely the ore found outside of the shaft pillar, in the old workings. It represents pillars abandoned

on account of the sand-run, the triangle of ore left between sub-levels on the flat footwall, other small pillars left on account of crushing ground and a small amount of new ore found 45 feet below surface at the top of the shaft pillar.

The ore remaining in the Austin Mine consists of the shaft pillar above the 3rd Level, and any ore which may be found in the old workings between the 3rd and 1st Levels. It is not assumed that there will be much ore found outside the shaft pillar. The estimate of approximately 90,000 tons may be increased to 100,000 tons by ore found in the old workings outside of the shaft pillar.

When the mine closed down, ore was being mined from the shaft pillar on the 1st, 2nd and 3rd Levels, and from three places in the old workings.

The Austinport stockpile is just South-east of the East end of the shaft pillar on the 1st Level, which has prevented regular mining operations in this territory, as there was some danger of caving the stockpile.

Operations were continued through No. 1 Shaft until practically all the ore was recovered from the old workings below the 3rd Level. It is estimated that over 25,000 tons of ore were recovered during the year below the 3rd Level, by scrambling through the old workings. North-west of No. 1 Shaft on the 3rd Level, in the old workings, two good sized pillars were being developed when the mine closed down. It is probable that several thousand tons will be obtained by scrambling operations here, when the mine reopens.

The estimated tonnage in the mine, sub-divided as required by the Tax Commission, is as follows:

Bessemer Ore:

Developed,	1. Austin Bessemer,	42,012 tons
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Non-Bessemer Ore:

Developed,	1. Austin,	10,503 "
	2. Austinport,	<u>37,373</u> "
	Total,	89,888 "

Throughout the year, there has been a heavy expense for construction

work. With the transfer of operations from No. 1 to No. 2 shafts early in November this expense was practically completed. In the early part of the year the trestle from No. 2 Shaft to No. 2 loading pocket was completed, also No. 2 loading pocket. New caves on surface, due to mining operations on the subs above the 1st Level, made it necessary to abandon the railroad loading tracks leading to No. 1 Shaft. Tram tracks were extended from No. 1 Shaft to No. 2 loading pocket, and the ore shipped during 1923 was loaded at No. 2 pocket. No. 2 Shaft-house was completed in the summer, also considerable work was done at No. 2 engine house.

It was planned to continue operating the Austin Mine during the winter, so new stocking grounds had to be prepared, sollar laid and new trestles erected. The only safe ground lay some distance away to the North-east, between the old railroad loading tracks to No. 1 Shaft, and the new tracks to No. 2 pocket. The surface of this ground was uneven and considerable expense was incurred in filling and leveling. Fortunately, the sand-fill for the approach to the old Austin coal trestle was close by and furnished material for the fill, which was made with a double-drum puffer and scraper. Sollar was made by laying 1" hardwood plank on the sand. Twenty-four bents were erected; the stocking trestle branching off from the trestle leading from No. 1 and No. 2 Shafts to No. 2 loading pocket. The trestle was constructed on an up-grade of $2\frac{1}{2}\%$, for 300 feet, the balance being level, as it was not practical to continue up-grade as legs were not available over 42-ft. in length. The estimated capacity of the new stocking grounds is approximately 45,000 tons. When the mine closed down, 8,612 tons had been stocked on the new stocking grounds.

On October 30th, a new cave came through to surface between No. 1 and No. 2 Shafts, near the transfer engine house. The engine house was moved to safe ground, the mine being idle on October 31st. Hoisting was resumed through No. 1 Shaft on November 1st, and continued until November 7th, when the ground started moving again, the cave becoming much larger, finally undermining the tram tracks from No. 1 Shaft to the stockpile. It was necessary to abandon No. 1 Shaft and transfer operations to No. 2. This work was taken up at once and completed within a week.

The development work underway on the 2nd Level was not completed, so that no product was obtained from the 1st Level during the five days the mine operated after the transfer to No. 2 Shaft. The 1st Level does not connect with No. 2 Shaft and at the time of the cave, a transfer raise was being put up from the 2nd to the 1st Level for handling the 1st Level ore. This transfer raise has since been completed so that when the mine re-opens there will be no delay in obtaining a normal hoist.

The cost per ton during 1923 was increased by the construction expense referred to above, by rock drifting and raising necessary on the 2nd Level for mining and handling the 1st Level ore, and by expense of transfer of operations from No. 1 to No. 2 Shaft.

This expense is now charged off and future operations at this property should not have to carry any unusual expense, as has been necessary during the past several years.

Work has been done during the year on the following sub-levels, and main levels:

SUBS ABOVE 1ST LEVEL
1ST LEVEL
SUBS ABOVE 2ND LEVEL
2ND LEVEL
SUBS ABOVE 3rd LEVEL
3RD LEVEL
SUBS ABOVE 4TH LEVEL
4TH LEVEL
5TH SUB ABOVE 1ST LEVEL (45 FEET BELOW SURFACE)

5TH SUB ABOVE 1ST LEVEL: (45' Below Surface)

This sub-level was opened in March, and mining completed the last of September. It was opened at the top of the shaft pillar. One raise was put up to the elevation of this sub-level in March, and another in August from the new drift in the footwall on the 1st Level. The width of the ore body was proven by a crosscut from the raise, which encountered the hanging in the back all the way across to the footwall, the ore being 70 feet in width. After crosscutting the ore body, it was developed by drifts along the strike, and

mining started. Some very high Phosphorus ore, running over 3%, was found on part of the sub-level. This ore was not mined.

While following this ore to the East the drift encountered loose ground, and a run occurred. It developed that there was only a few feet of ledge over the back of the drift, with dry sand above. The cave extended through to surface, coming up near the loading tracks to the Austin Bessemer pile. Work was temporarily stopped on the sub-level until the Austin Bessemer stockpile was removed, after which work was resumed.

The ore body on the sub-level was very irregular in outline, the first crosscut from the raise being located at the widest part. It had an extreme length from East to West of 200 feet, the average width being about 30 feet. Later in the year another raise was put up to this sub-level, in order to permit of more rapid mining of the ore.

A drill hole was put down on surface about 40 feet to the North-east of the sub, in order to prove if the ore extended further to the East; this hole encountered only a small amount of lean jasper.

The ore on this sub-level was not figured in the estimates of available ore, as it was some distance above the known limits of the shaft pillar.

The cave resulting from the removal of the ore on this sub-level has come through to surface over the entire area of the sub-level.

4TH SUB ABOVE 1ST LEVEL (57' Below Surface)

This sub-level was opened in July, and work continued here until the mine closed down on November 19th. Mining was about 50% completed here when the mine closed down. The ore body was not as large as on the sub above, and also some areas had to be abandoned on account of the Phosphorus running too high for "Austinport" ore. On one side of the sub-level there were some pyrites found in the ore, in small seams 1/2" or more in thickness, near the hanging. These areas were also abandoned, as the Sulphur content was quite high.

3RD SUB ABOVE 1ST LEVEL:

Work was done on this sub-level in January and February. It proved

that this ore body was of sufficient size to warrant driving a drift into the footwall on the 1st Level, and putting up of raises to mine the ore at higher elevations. The work done here in 1923 was a continuation of the work started in November, 1922, when this ore body was first found. Work was stopped here as soon as it was determined that the ore body warranted development at higher elevations; work will be resumed here when the top of the ore body is mined out.

2ND SUB ABOVE 1ST LEVEL:

During January and February, a pillar of ore was mined on this sub-level at the West side of the shaft pillar. In March, a drift was driven to the East along the foot, to outline the balance of the shaft pillar. Work was continued on this drift during March; after advancing 60 feet, this drift holed to the crosscut from another raise on this sub-level. No further work was done here until July, when the mine went on single shift. The old drifts on this sub-level were then retimbered, after which the mining of the East end of the shaft pillar was started. In this territory the ore extended about 25 feet above the sub-level, where it pinched out, due to the foot and hanging coming together. Mining was continued here for the balance of the year, practically all the ore being mined out when the mine closed down in November. The ore on this sub-level connects with the ore on the higher sub-levels, at only one place about 20 feet in length along the foot; at all other points above this sub-level the ore pinches out. At the end of the year it was estimated that there were only a few hundred tons of ore remaining to be mined on this sub-level.

1ST SUB ABOVE 1ST LEVEL:

A block of ore on the West side of the shaft pillar was removed on this sub-level during the first four months of the year. No further work was done here until in November, when the development of the sub-level on the East side of the shaft pillar, was started. There is considerable ore remaining to be mined on this sub-level; the length of the pillar is approximately 110 feet, and it will average 30 feet in width.

1ST LEVEL

During the early months of the year, development work was underway on the 1st Level. The work on the 3rd sub above the 1st Level proved that the ore extended some distance above this sub-level. In order to reach this ore it was necessary to drive a rock drift into the footwall and put up raises. The rock drift was driven into the foot a distance of 182 feet during January and February, after which a raise was put up a distance of 65 feet to the hanging, at which elevation a sub-level was opened. No further work was done on the 1st Level until in July, when the mine went on single shift, when three gangs started working here. A branch drift was driven to the East from the drift into the footwall, which had been driven in January and February, in order that another raise might be put up to the 5th sub above the 1st Level, as the ore had been found to extend so far to the East that it was not practical to handle it all through one raise. This rock drift was driven a distance of 60 feet to the East, and a raise put up to the 5th sub above the 1st Level. In July, two gangs started repairing drifts, preliminary to mining part of the East end of the shaft pillar. Work was continued in this territory until the mine closed down. The ore was mined on the footwall above the old East haulage drift for a distance of 50 feet. The East end of the shaft pillar was mined up to the hanging over an area approximately 20 feet by 90 feet in size. It is not planned to do much more mining at this point, as it is not considered advisable to extend the old cave any great distance, as this might cause it to break through to surface near the "Austinport" stockpile.

During the year there was a total of 342 feet of rock drifting and raising on the 1st Level. As far as can be judged at this time, no further rock drifting or raising will be needed on the 1st Level.

SUBS ABOVE 2ND LEVEL.

3RD SUB ABOVE 2ND LEVEL:

In May, one contract worked on this sub-level, mining the ore on the

West side of the shaft pillar. A line, termed the "limit of mining" for this territory was drawn through No. 1 Shaft back to the footwall. It was decided to mine the block of ore lying West of this line. There was comparatively little ore here, as the greater portion of the West part of the shaft pillar is cut off at the elevation of the 3rd sub-level by a horse of jasper. Mining was completed, and the floors lagged down by the end of the month.

2ND SUB ABOVE 2ND LEVEL:

Work was started on this sub-level in February, and continued through March, a small block of ground near the hanging being mined at the East side of the shaft pillar. This started work on a block of ore in the shaft pillar which will be mined from the 2nd sub above the 2nd Level, down to the 3rd Level. It is planned to cut the ore off on an angle of 60° above the footwall on the 2nd Level, so as to prevent caving. This made it necessary to start slicing under the hanging at the elevation of the 2nd sub. Work was completed here in March, the contract then dropped down to work on the 1st sub, directly below this area.

Work was resumed on the 2nd sub-level in May, in the shaft pillar West of No. 1 Shaft, following the finishing of mining operations on the 3rd sub, in this territory. Work was continued on this sub-level, in this area, until the mine closed in November, two gangs working here the balance of the summer. Considerable more ore was found here than had been anticipated. Near the old cave, at the West end of the shaft pillar, the ore was found to extend up a considerable distance on the footwall, having a thickness of about 10 feet. This ore was mined with scrapers, as the foot was so flat that the ore could not be handled through raises. The greater part of the ore on this sub-level, in the block West of the line drawn through No. 1 Shaft, had been mined at the end of the year. The "Mayne" loader which was purchased for the Austin Mine was used by one of the contracts on this sub-level, in October and November.

1ST SUB ABOVE 2ND LEVEL:

One contract mined the ore on the hanging in the shaft pillar East of No. 1 Shaft during March, April and May. This was a continuation of the mining of the block on the East side of the shaft pillar. Work was completed here in May, after which mining started on the sill floor of the 2nd Level, in this territory.

2ND LEVEL

The first of the year some ore was mined on the 2nd Level, by scrambling along the sides of the drift which had been driven to the East through the old workings. This work was completed in February, all the ore being removed back to the East end of the shaft pillar.

It was then decided to drive a drift following the ore on the footwall through the shaft pillar, behind No. 1 Shaft. This drift was started in February and completed in April. It was driven a distance of 115 feet, and outlined the ore along the footwall. One raise was put up from this drift to the hanging, which was encountered at the elevation of the 2nd sub above the 2nd Level.

No further work was done on the 2nd Level until in June, when a contract started mining ore on the sill floor of the 2nd, at the East end of the shaft pillar. Mining was continued on the shaft pillar East of No. 1 Shaft for the balance of the year.

The last of June, a rock drift was started midway between Nos. 2 and 1 Shaft, which was driven into the footwall to be used in mining the ore between the 1st and 2nd Levels. It was also planned to put up a transfer raise here for handling the ore mined above the 1st, after operations were transferred from No. 1 to No. 2 Shaft. This transfer raise would be necessary, as there was no connection to No. 2 Shaft on the 1st Level, and there was not sufficient ore on the 1st to warrant driving the long rock drift necessary to reach No. 2 Shaft. The rock drift was continued for

the balance of the year, and lacked only 30 feet of being completed when the mine closed down on November 19th. The transfer raise for handling the ore on the 1st Level was started the last of October, and was completed the last of November. Work was continued on this raise after the mine closed down, as it was considered advisable to complete it so that there would be no delay in handling the 1st Level ore when the mine reopened. A year ago it was estimated that there were 58,182 tons of ore in the shaft pillar between the 1st and 2nd Levels. During 1923, 12,757 tons of this ore was mined, so that there are 45,425 tons remaining in this territory.

Two rock raises for handling ore will have to be put up to the 1st Level when the mine reopens. With the exception of these two rock raises, and perhaps two or three in ore, all development work in connection with the mining of the shaft pillar between the 1st and 2nd Levels, has been completed.

SUBS ABOVE 3RD LEVEL.

4TH SUB ABOVE 3RD LEVEL:

Work was started on this sub-level in July, when a rock crosscut was driven from the top of a new raise put up from the 3rd Level, through the hanging, to the ore body. This crosscut holed into an old hanging wall drift in ore which had been driven on this sub-level many years ago. The timber was caved, and work was continued here until the old sub-level had been retimbered. After finishing retimbering the old sub, a drift in ore was driven along the foot to the West to the old cave. The contract then went to the top of another raise which had been put up from the 3rd Level, and drove a crosscut from the hanging over to the footwall drift. There was a total of 185 feet of drifting on this sub-level, besides the retimbering work in the old sub.

The last of October, a raise was put up from the footwall drift on the East side of No. 1 Shaft, near the East end of the shaft pillar. This raise was put up to the elevation of the 4th sub above the 3rd, and the work of cutting out from the raise was underway at the time the mine closed down.

Mining had been completed on the 2nd Level, at the East end of the shaft pillar, and it was planned to start mining on this sub-level, directly beneath this area.

2ND SUB ABOVE 3RD LEVEL:

In January, ore was mined on this sub-level near the East end of the old mine, in the old workings. A pillar of ore was found here, above which there was a triangle of ore lying on the foot extending all the way from this sub-level up to the floor of the 2nd Level. This triangle of ore was mined, using double-drum hoists and scrapers, after which the pillar was removed on the sub-level, work being completed at this point in April.

On the West side of the shaft, just outside the shaft pillar, two gangs worked during January, February and March, removing some pillars left in the old workings, and also the triangle of ore left on the footwall, above the sub-level. All of the ore mined on this sub-level in 1923 came from scrambling work in the old workings outside of the shaft pillar.

1ST SUB ABOVE 3RD LEVEL:

This sub-level was opened near the Stephenson boundary line, at the East end of the old Austin Mine workings, in January. A small pillar was found here which was developed and mined. A little to the West of this point, a larger pillar had been found on the sub-level above, and when work was completed on this sub-level in April, work was resumed on the lower sub-level. This pillar was mined out after which another raise was put up from the 3rd Level drift nearer No. 1 Shaft, and another pillar found and mined. Work was continued in this territory for the balance of the year, the small pillars left near the old raises being mined, as also the triangle of ore left on the footwall. Work was not completed in this territory when the mine closed down.

In February, a raise was put up in the shaft pillar from the 3rd Level drift West of the shaft, and a drift driven to the hanging. Two slices were taken along the hanging. This work was done in order to get a higher

percentage of extraction than would have been the case if it was attempted to cave the ore by slicing operations on the sill floor of the 3rd Level. This work was completed early in March.

3RD LEVEL.

In the latter part of 1922, a drift was started in the foot to the West of the crosscut from the shaft, from which it was planned to put up raises for mining the shaft pillar above the 3rd Level, on the West side of the shaft. This drift was completed in February, being connected to the old footwall drift at the West end of the shaft pillar. On the completion of this drift, work was resumed in extending a drift through the old workings towards the West end of the Austin ore body, where it was rumored some ore pillars had been left, due to a cave which closed all of the drifts in this territory. Work was continued on this drift throughout the year, the advance being 150 feet. When the mine closed down, two drifts were being driven in this territory, in ore pillars. The advance of the drift was greatly hindered during the year due to water in the caved ground, which caused runs of broken-up hanging material. This made it very difficult to advance, as it was often necessary to put in two sets of fore poles before any head-way could be made. The ore developed here during the last few weeks the mine operated indicate that the expense incurred in this drift was warranted, as there will apparently be considerable ore recovered from pillars in the old workings in this territory.

In the first half of the year the balance of the shaft pillar on the sill floor of the 3rd Level was mined. The latter part of the year the work of putting up raises in the rock haulage drift East of the shaft was started, one raise being completed to the elevation of the 1st sub below the 2nd, when the mine closed down.

In addition to the above work, the bottom of the rock drift between No. 1 and No. 2 Shafts was taken up and permanent tracks and ditch installed. This work was done in anticipation of the transfer of hoisting operations from No. 1 to No. 2 Shaft. The drift near No. 2 Shaft was also widened for a

switch, so that cars could pass here.

SUBS BELOW 3RD LEVEL.

1ST SUB BELOW 3RD LEVEL:

In the early part of the year the ore remaining on this sub-level, in the shaft pillar below the 3rd Level, was mined.

At the extreme South-east end of the old workings, near the Stephenson boundary line, this sub-level was opened from a raise put up from the new rock drift in the footwall, on the 4th Level. A large pillar was developed at this point, its length being 200 feet; its width, at some points being as great as 40 feet. Mining of this pillar was continued from February through June. No work was done on this sub-level in July, work being resumed in August, when the mining of the pillar left between two raises was started. Work was completed on this sub-level in October, the pillar referred to in the previous sentence being mined and also the triangle of ore left on the footwall between this sub and the 3rd Level.

2ND SUB BELOW 3RD LEVEL:

This sub-level was opened in June from two raises put up from the new footwall drift in rock on the 4th Level, and after developing the pillar which had been left in the old workings here, mining started at the Stephenson boundary line and was continued until work had to be abandoned here at the end of the first week of November. It is estimated that there was less than 500 tons of ore left on this sub-level, which could not be mined, due to abandoning operations at No. 1 Shaft. During July, August and September, three contracts worked here, and a large tonnage was obtained. The pillar on this sub-level was about 220 feet in length; its greatest width was 47 feet, the average width being about 35 feet. This was evidently a pillar which had been left in this territory to hold back the sand which came into the mine, due to a cave near the Stephenson boundary line. There is a

flattening of the foot in the floor of this sub-level, so that the workings on the lower sub-levels did not come directly beneath this pillar. It, therefore, acted as a dam to hold back the sand from the lower workings. It was estimated that there was at least 20,000 tons obtained from this territory.

3RD SUB BELOW 3RD LEVEL:

A raise was put up from the footwall drift on the 4th Level, in the old workings, East of the shaft, in August, and a small triangle of ore was found lying on the foot. Mining was continued here through August and September, by which time all the ore had been mined.

4TH LEVEL.

The latter part of 1922, it was decided to reopen the old footwall drift to the East, through the old workings, in order to reach a point from which raises might be put up to the 3rd Level. The showing of ore in the old workings near the Stephenson boundary line on the 3rd Level was such that it was thought probable the pillar found on the 3rd would extend some distance below the 3rd. The old footwall drift on the 4th Level was reopened through caved ground, and in January was turned in a North-easterly direction into the footwall, where it was extended a distance of 105 feet. Two raises were put up from this drift to the elevation of the first sub below the 3rd Level, where ore was mined until operations were abandoned at No. 1 Shaft at the end of the first week of November. The cost of this drift was amply justified by the ore which was found below the 3rd Level, near the Stephenson boundary line.

The rail, pipes, sub-level cars, etc., used on the sub-levels above the 4th, and on the 4th Level, were removed. The shaft has been covered over on the 3rd Level, a door being made in the ladder road so as to keep an opening available for a traveling road between the Stephenson and Austin Mines. This cover has been made tight so as to prevent the formation of ice below the

3rd Level in No. 1 Shaft. In traveling between the two shafts it is planned to use No. 2 Shaft to the 3rd Level, then to cross over to No. 1 Shaft and climb down from this point to the connection to the Stephenson Mine. No. 1 Shaft passes through the ore body at a point half-way between the 2nd and 3rd Level. When the shaft caves, due to mining of the shaft pillar, it should remain open on and below the 3rd Level, which is in the footwall.